UCSD Physics Department Handbook

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This document is designed to serve as a resource for undergrads and is updated, as needed.

To request for something to be added/updated, please click here.

Table of Contents

Advising **5**

General Information 5

Virtual Advising via the Virtual Advising Center (VAC) 5

Upcoming Physics-Advising Closures (Including VAC) 5

Some Do's and Don'ts when using the VAC 6

Appointments 7

When Appointments are Available in Physics 7

Requesting an Appointment in Physics 8

For Current Physics Majors for Summer 2025 8

For Current Students who are Non-Majors During Summer 2025 8

OSD Accommodations **8**

Orientation **9**

Frequently Asked Questions (FAQs) by Incoming Transfer Physics Majors 9

Frequently Asked Questions (FAQs) for Incoming Freshman Admits 11

Five Steps Physics Majors Should Take Early on in their Undergraduate Career 16

Majors **18**

How Much Math is Used in Physics? 18

The Phasing out of Majors with Specializations 19

Differences between the BS and BA Degree 20

Changing Between the BA and BS in Physics 21

Pathways through Physics 21

Major Checklists 22

Frequently Asked Questions about the Physics Major 23

Exceptions to Major Requirements/Regulations (for current physics majors only) 27

Major Regulations 27

Changing a Major Within Physics 27

Changing to a Major Outside of Physics 27

Programming Course Options 28

Physics Course Offerings by Term 30

How to Plan Your Schedule 30

Having a Qtr-by-Qtr Plan Reviewed 32

How to Use "Free" Space in Your Schedule 34

How to Find Supplemental Courses Applicable to My Field 34

Course Recommendations by Physics Faculty 35

Substitute Physics Courses 35
Frequently Asked Questions (FAQs) About Low Grades & How They Impact Major Progress 35
Is Physics the Right Fit for Me as a Major? 39
Where do UCSD Physics Majors End Up? 40
Joint Majors 42
Double Majors 43
Eligibility to Add Physics as a Double Major 43
What to do Before Deciding to Double Major 44
Administrative Planning for a Double Major 45
Time-to-Degree for Double Majors 46
Is my proposed double major feasible? 46
Additional Double Major info. Specific to Non-Majors 47
Additional Double Major info. Specific to Current Physics Majors 48
Instructions for Filling Out & Submitting the Double Major Packet 48
How to Fill Out the Double Major Form 49
How to Fill Out the Statement of Purpose 50
How to Fill Out the Quarter by Quarter Plan 50
How to Properly Schedule the Physics Major Requirements on the Qtr-by-Qtr Plan 51
Submitting and Routing Your Complete Double Major Packet 52
Minors 52
Plan for a Minor Outside of Physics 53
Common Minors for Physics Majors 54
Plan for a Minor in Physics 54
Study Abroad 55
Finding a Program & Planning to Apply to Study Abroad 55
Doing Research while Abroad 55
Qtr-by-Qtr Planning for the Time You'll Be Abroad 55
Course Equivalency for Study Abroad Courses 56
Completing & Submitting the EAP Planning Form 56
The Physics Honors Program (PHYS 199H) 57
Applying to the Honors Program 57
How to Fill out the Description of Honors Thesis Research Project and Bibliography 57
How to Obtain a Copy of Your Most Recent Degree Audit 57
Submitting Your Complete Honors Program Application 57
Research & Related Internships 57
Learning About Research Fields 58
Research Skills 59
Engaging with Researchers About a Potential Opportunity 59
Frequently Asked Questions (FAQs) About Contacting Faculty about Research 60
Seeking Out & Securing a Research/Internship [or related funding] Opportunity 61
Summer Opportunities off Campus - REUs 61
Letters of Recommendation for Opportunities You Apply for 62

Summer Opportunities on Campus 62
Other Opportunities on Campus (Various times of Year) 62
98s, 99s, 198s, 199s, 199Hs (aka Special Studies Courses) 63
Additional Course-Specific Policies for Special Studies 64
How to Sign Up for a Special Studies Class in Physics 64
Taking a Special Studies Class Outside of Physics 65
Publishing and Presenting Your Research, Attending Conferences 65
Graduate Studies in Physics **67**
Where have UCSD Physics Majors Gone? 67
Master's and PhD Programs in Physics outside of UCSD 69
Master's and PhD Programs in Physics at UCSD 69
Post-Baccalaureate Programs for Physics 70
Bridge Programs for Physics 71
Tips for Academic Planning at UCSD for Graduate School in Physics 71
Tips for Applying to Graduate School 72
Finding a School 72
Picking a PhD Advisor 73
Considering the School Itself 74
Questions to Ask While Visiting Graduate Schools 74
Graduate Program Applications 74
The GRE (General and Subject) 75
Tips for Taking the GRE 75
The Curriculum Vitae (CV) 77
The Statement of Purpose 77
Letters of Recommendation 77
Graduate School Fellowships 79
Company Sponsored Funding for Graduate School 79
Careers for Physics Majors **80**
Career Exploration 80
Tips for Writing an Effective Resume 82
Student Clubs **82**
Society of Physics Students (SPS) 82
Young Physicists Program (YPP) 82
Finding / Starting a Student Organization 83
Administrative Info. for Student Organizations 83
Tools for Physics Majors & Those Taking Physics **83**
The Degree Audit 84
How to Get in Touch with Physics Faculty 84
Strategies for Success in Physics 84
Making Sure Your Courseload is Manageable 85
Forming Study Groups 86
How to Improve Academically 86

On Improving from One Exam to the Next 87
On Effort and Time… 88
Additional Resources to Improve Academically 88
Exam Preparation 89
Physics Calendar of Events & Opportunities 89
Student Jobs 89
Policies **90**
Academic Integrity 90
Enrollment 90
Student Conduct 90
Relationships Between Undergraduates and UCSD Employees 90
Course Equivalency 91
Lower Division Physics Courses from Other UCs and California Community Colleges 91
A-Level Course Exemptions 91
Equivalency by Petition 91
Exceptions to University Policy 92
Quarter Limit Policy 92
Unit Limits & Exceptions 92
Resources (Campuswide) **94**
Basic Needs 94
Urgent Assistance 94
Campus & Department Safety 94
Academic Advising 94
Educational Resources 94
Student Services Resources 95
International Resources 96
Health and Wellness Resources 96
Online Self-Care Support and Resources for Students 97
Student Affairs Resources 97

Advising

General Information

Advising is available to current and prospective physics majors, minors, and for students taking physics classes for other majors, minors, GEs and/or personal interest.

VAC Messaging: Send messages 24 hours, 7 days a week (except during holiday closure periods).

Face-to-Face Advising: Click here to see options and protocols for face-to-face advising.

Advising from Faculty Advisors: Click here to see contact info for Physics faculty advisors.

Workshops: Book a 1:1 meeting to discuss double major planning, planning for a minor, and/or how to personalize your academic plan! Click here for registration link!

Closures: Please see Upcoming VAC Closures.

Please Note: All matters of enrollment, waitlists, prereqs, late adds, etc. are managed at the department level and students must use the options below to reach out.

Virtual Advising via the Virtual Advising Center (VAC)

The Virtual Advising Center (VAC) is the system we use exclusively to advise and assist current UCSD students and to schedule appointments. **Please Note: We cannot advise a current or incoming UCSD student via email and cannot see any emails they send.** Please watch this short video to learn how to use the VAC. The VAC is part of your official UCSD record and it is important that you use the VAC appropriately so that you keep your record as clean as possible - this includes the record being clear of any duplicated information (see the "Do's and Don'ts" for more info.).

You can send us a VAC message anytime, and we typically respond within 1-3 business days. However, the VAC is closed during campus holidays and closures, and you cannot submit messages during these times. Email or phone cannot be used as a substitute. Please wait until the VAC re-opens to send your message.

Upcoming Physics-Advising Closures (Including VAC)

Please see Upcoming VAC Closures.

Some Do's and Don'ts when using the VAC

These do's and don'ts may help you when using the VAC.

Do...

1. Check your VAC regularly to make sure you haven't missed any messages. You should also set up text message notifications in case you miss an email alerting you that you have a VAC message waiting for your review. Sometimes a VAC message you receive will ask you to review a previous message. To do this, look on the menu on the left side of the screen and click "Contact Record", then locate the previous message you've been asked to review.
2. Use VAC to ask questions NOT already covered in past VAC messages and/or posted information you've already been referred to.
3. Send messages to the appropriate office:

Your College	Questions/Concerns about GE and University Requirements
Your Major Department	Questions/Concerns about your major
Another Major Department	Questions/Concerns about their major(s), minor(s), and courses they offer
EAP	Questions/Concerns about Studying Abroad

4. It helps a lot if you are very direct and clear in your messages. But sometimes you may not know exactly how to frame something. That's ok! Please do your best and we'll do our best to help you. :)
5. Allow up to 3 business days to receive a reply to your message.
6. Use Contact Record numbers to reference information in past VAC messages instead of copying and pasting info. from a previous VAC message into a new VAC message. For example, "In reference to VAC Contact Record 3245141, yes, I would like to use MUS 121 towards my Arts GE requirement."
7. Check your Contact Records anytime you're not sure that your message was successfully submitted in the VAC. The Contact Records tab will show you all past messages.

Don't…

1. Send the same message to multiple offices. If you are not sure who to send your question to, send the message to your college and they will forward it to the appropriate office.
2. Commingle questions for multiple offices.
3. Copy and paste into a new VAC message ANY information in a previous VAC message. All past messages are saved in VAC and can be viewed by advisors, so there is no need to copy

and paste in past messages. Instead, just list the Contact Record number that your new message is in relation to.
4. Ask questions previously addressed in VAC or in posted information you've been referred to.
5. Use VAC to request clearance to enroll; these requests go through EASy.
6. Speak in an inappropriate manner. This would violate campus policies on student conduct and could result in disciplinary action.
7. Use the VAC to discuss matters that do not relate to your education at UCSD.
8. Assume that a message you sent did not go through and resend the message. Only resend your message if you do not see it in your Contact Records tab.

Appointments

Appointments are designed to address non-urgent matters only. For urgent matters, please send your inquiry through VAC. When requesting an appointment we'll try to collect as much info. from you as possible in order for us to best prepare for your meeting and also so we can provide some preliminary info. for you to review, and that way you can come to the meeting with some follow-up questions in mind.

Appointments are not designed for quick questions or for information that is clearly addressed in posted information. **Appointments are also not designed for having documents processed (click here to submit documents for processing).** If you want to request an appointment to discuss documents you need/want reviewed/processed, you must first submit your material *and then* follow the appointment protocol below exactly as listed, including the specific questions you have about your documents that you hope to have addressed at your appointment.

When Appointments are Available in Physics

Appointments are available at different parts of the academic term; appointments are not available during school breaks. Appointments must be scheduled in advance (we do not offer "on the spot" appointments). Please see your category below.

- **Incoming FA25 Physics Majors:** Appointments will begin in week 1 of FA25.
- **Incoming FA25 Non-Physics Majors:** Appointments will begin in week 3 of FA25.
- **Continuing Physics Majors:** Appointments are available in weeks 1-10 (fall, winter, spring) and weeks 1-5 (summer sessions 1 and 2).
- **Continuing Non-Physics Majors:** Appointments are available in Fall, winter, spring, in weeks 3-6 and week 10, and weeks 1-5 (summer sessions 1 and 2).

Requesting an Appointment in Physics

For Current Physics Majors for Summer 2025

Please click here to learn about appointments in Physics and follow the appointment request instructions *for PHYS majors* exactly as described.

For Current Students who are Non-Majors During Summer 2025

Please click here to learn about appointments in Physics and follow the appointment request instructions *for non-majors* exactly as described.

PLEASE ALSO NOTE

An appointment may not be scheduled if:

- You have unread past VAC Contact Records from any UCSD personnel.
- Your request is missing info. that must be included.
- You have not provided enough availability to be matched with an open slot on our appointment calendar.
- Your matter/question is able to be addressed in VAC.

Once your appointment has been scheduled:

- You will be notified through VAC and it will be your responsibility to attend the appointment at its scheduled day and time (no reminder will be sent so please be sure to note the appointment in your personal phone/calendar/planner).

If you need to cancel/reschedule your appointment:

- It is your responsibility to alert PHYSICS through the VAC at least 24 hours in advance of your appointment and to submit a new appointment request.

If you miss your appointment and gave no notice that you need to cancel/reschedule:

- You may request a new appointment. In most cases, your new appointment will be scheduled *at least* one week after the missed appointment. If your missed appointment falls in the last week of appointments for the term, your new appointment will be scheduled in the subsequent term.

OSD Accommodations

Please click here to learn about OSD in Physics.

Orientation

Each incoming physics major receives a VAC message the summer before they start at UCSD. This correspondence helps them prepare for incoming student enrollment. The Department also hosts an annual mandatory orientation for incoming freshman and transfer students during week 0 of the fall term. During this event, members of the Department would love to welcome you and help orient new students to Physics advising, curriculum, opportunities, and resources available during your time at UC San Diego.

Frequently Asked Questions (FAQs) by Incoming Transfer Physics Majors

Review this information regularly for updates - questions and answers get added up until orientation!

Q: How do I plan my self-select courses (i.e., PHYS UD LAB, PHYS UD DEPTH, and/or PHYS UD RE) on the standard plan for transfers?
A: These courses are distributed across the quarter-by-quarter section of your plan. As stated in the *Department Comments* below the qtr-by-qtr section of your plan, these requirements *may* move around on the plan based on the courses you choose, their prerequisites, and the term they are offered by the department that owns them.

Because there are multiple options for each requirement, we cannot suggest exact terms for these courses. The good news is that with so many choices, you'll be able to find eligible options every term that count toward the major. *Reminder, there are existing FAQs that describe core vs non-core UD PHYS classes and that cover courses that DO NOT have PHYS 4 as a prereq.*

Rather than enrolling only in what you're currently eligible for, aim for courses that strengthen your knowledge, skills, and abilities in your target area(s). Review the course descriptions to identify those that interest you most, then check prerequisites and offering terms to see how they fit into your plan.

For more guidance, see the department handbook sections:

- How to Plan Your Schedule
- How to Use "Free" Space in Your Schedule
- How to Find Supplemental Courses Applicable to My Field
- Course Recommendations by Faculty

Q: How many units should I take in Fall?
A: 12-14, max, is what we'd recommend (three 4-unit classes and no more than two 1-unit seminars).

Q: When/how do I enroll for Fall?
A: This should have been covered in the Orientation information provided to you by your college. If not, click here to learn about enrollment and adhere to your enrollment appointment as shown on WebReg. Be sure to use your PASS 1 to enroll in PHYS 4C (and MATH 20E if you don't have transfer credit for this class).

Q: What are the "core" UD PHYS courses?

A: Core UD PHYS courses are ones that are in the PHYS 100, 105, 110, 120, 130, and 140 series. Core UD PHYS courses all require PHYS 4 series courses as prereqs (PHYS 2 series lecture courses are not accepted as prereqs for core UD PHYS courses).

Q: What are the “non-core” UD PHYS courses?
A: Non-core UD PHYS classes are courses that ARE NOT in the PHYS 100, 105, 110, 120, 130, and 140 series.

Q: Do all UD PHYS courses require prior completion of the PHYS 4 series?
A: No, not every UD PHYS course requires prior completion of the PHYS 4 series (eg. PHYS 139s, 141, 142, just to name a few). It is important to carefully review the Physics Courses section of the catalog to see the prereqs for each UD PHYS course.

Q: What happens if a Fall course I want to take has a waitlist?

A: If a course is full, check the website of the dept. offering the course to see if waitlist info. is posted. If not, reach out to that dept. through the VAC to inquire about how waitlisting goes. Keep in mind that each dept. has its own enrollment/waitlist policies and protocols and you must adhere to each department's information. Also keep campus policies, procedures and timelines for waitlists.

Q: If I change to a major outside of physics can I change back to a major in physics?
A: **No**. If you change to a major outside of the Physics Department (i.e. you change to a major code that DOES NOT start with the letters “PY”) you **cannot** re-add a physics major, not even via the Double Major process.

Q: Can I have a double major with two different majors within physics?
A: No. You can only have one major within a single department.

Q: Can I have a double major in physics and a major in another department?
A: Yes. Be sure to follow our Instructions for Filling Out & Submitting the Double Major Packet exactly as listed.

Q: Can I have a minor in another department?
A: Yes. See the Plan for a Minor Outside of Physics info. for more on this topic.

Q: What careers can I pursue with a degree in physics?
A: The possibilities are endless! Many students who have a B.S. in physics are hired as engineers. Others go on to pursue careers in computing, business, law, education, medicine, etc. Pursuing graduate education is also very common in advance of going into industry. See Career Center webpage.

Q: How quickly can I get involved in research in the department?
A: As quickly as you secure a faculty mentor willing to take you on as a researcher or lab assistant. Click here and read the main section and all subsections so that you have all the need-to-know info. about getting started w/ research in Physics.

Q: Can transfer students participate in the Physics Honors Program?
A: Provided the eligibility requirements have been met (see here), transfer students can apply to the Physics Honors Program. In most cases, transfer students who want to participate in the Physics Honors program elect to request to extend their time-to-degree beyond two years to provide more time to meet the eligibility requirements and complete the Honors program.

Frequently Asked Questions (FAQs) for Incoming Freshman Admits

Review this information regularly for updates - questions and answers get added up until orientation!

Q: What should I do if I have a question not answered in these FAQs?
A: First, proceed to the *Table of Contents* at the beginning of this handbook and see if your question is addressed in one of the other sections. If not, then please contact PHYSICS through VAC to submit your question. Keep in mind that if your question *is* covered in posted information, the Department will refer you to the posted information so that you can read it and spend some time digesting the information. Keep in mind that posted UCSD information represents the binding agreements between you and the University, so you *should* know and understand it.

Q: What are the physics major requirements and what are the prereqs for courses required for my major?
A: As all of the posted and provided plans indicate, you should refer to the Physics Curriculum section of the catalog and the current major checklists to see the requirements for each major/specialization offered in the Physics Department. Please see the Courses sections of the catalog for prerequisites for courses required for your major.

Q: Where can I see the courses I'm exempt from based on my AP scores, transfer coursework, IB exams, etc.? How do I fill free space in my schedule (eg. if I'm done with a math course early)?
A: Check the "UCSD Approx" column on your Academic History Report and your Degree Audit to see your course exemptions. If the "UCSD Approx" column does not show an equivalency for a particular course/exam you transferred in, proceed to the Equivalency by Petition information. If you are exempt from a major requirement due to AP scores**, transfer coursework, and/or IB exams, your degree audit will confirm this by showing you the requirement has been met. In this case, **do not** repeat the class at UCSD. Cross the class off on your standard plan or alternate plan and consider using the free space in your schedule as follows (in some cases, waitlisting may be needed):

Consider...

- taking remaining GEs and/or university requirements (second most common);
- getting ahead in math requirements (most common, especially as the stronger you are in math, the stronger you're likely to be in PHYS);
- taking courses for a second major and/or a minor;
- taking courses that will enhance your Knowledge, Skills, and Abilities (KSAs) in your target career field;

- looking for research that could result in enrollment in a Special Studies “99” course under the supervision of a faculty member (this option is mostly for students AFTER their first year at UCSD).
- **Students exempt from PHYS 2A-B via AP/IB credit can move PHYS 2CL earlier on their plan

Q: What major-related classes should I take each term, starting in fall of year 1?
A: Each incoming freshman admitted to a Physics Major received a VAC message informing them they must follow either the Standard Plan or one of our Alternate Plans. It is imperative to carefully read and follow the guidance in that VAC message. (Note that the “Transfer Plans” for the Department of Physics ARE NOT options for freshman admits; no exceptions are granted).

Q: If I am following the **standard academic plans**, can I move my required MATH courses on my 4-year plan?
A: Yes, as long as you keep in mind the prereqs for the PHYS 4 series:

- MATH 20A is a prereq for PHYS 4A, so take MATH 20A no later than (NLT) fall of year 1.
- MATH 20B is a prereq for PHYS 4B, so take MATH 20B no later than (NLT) winter of year 1.
- MATH 20C and MATH 18 are prereqs for PHYS 4C, so take MATH 20C & MATH 18 no later than (NLT) summer of year 1.
- MATH 20***E*** is a prereq for PHYS 4D, so take MATH 20E no later than (NLT) fall of year 2.
- MATH 20***D*** is a prereq for PHYS 4E, so take MATH 20D no later than (NLT) winter of year 2.

Q: If I am ahead in MATH, which one(s) should I take first (I already know not to take any of them too late per the Q & A above)?
A: Please consult with the MATH Dept. through VAC for their advice on this, as they are the authority on the best sequencing of their courses. As it relates to physics, the best order to take the courses actually matches the order we list them on our plans (eg. 20E ahead of 20D). Students seeking the honors math series should really like math and want to be especially challenged. These students need to start the honors series in fall of year 1.

Q: If I am ahead in MATH, can I take the honors math series (MATH 31AH-BH-CH) for my major and course prerequisites?
A: Students eligible for the Honors MATH program typically pursue it if it aligns with their personal interests and academic goals (see here). The standard courses—MATH 18, 20C, and 20E—**are** sufficient prerequisites for the PHYS courses they are intended for and are generally offered every term. In contrast, the Honors MATH sequence (MATH 31AH, 31BH, and 31CH)

must be taken in a specific order across the Fall, Winter, and Spring quarters, respectively, during year 1:

Here is a comparison of the enrollment timing between the standard and honors math courses:

- MATH 31AH should be completed in Fall of Year 1, while MATH 18 can be taken anytime *before* Fall of Year 2. Note that students only need to complete either MATH 18 or MATH 31AH to meet the "Linear Algebra" prerequisite for PHYS 4C, which is offered in Fall of Year 2.
- MATH 31BH should be completed in Winter of Year 1, while MATH 20C can be taken anytime *before* Fall of Year 2. Note that students only need to complete either MATH 20C or MATH 31BH to meet the "Multivariable Calculus" prerequisite for PHYS 4C, which is offered in Fall of Year 2.
- MATH 31CH should be completed in Spring of Year 1, while MATH 20E can be taken anytime *before* Winter of Year 2. Note that students only need to complete either MATH 20E or MATH 31CH to meet the "Vector Calculus" prerequisite for PHYS 4D, which is offered in Winter of Year 2.

When planning your enrollment, consider the availability and scheduling requirements of the Honors MATH courses compared to the standard sequence. In some cases, it may not be possible to take the entire honors MATH series due to unavoidable schedule conflicts.

Q: I am not eligible to take MATH 20A in fall of year 1. Can I still follow the standard 4-year plan for graduation?
A: No. Instead, you will need to follow one of our Alternate Plans for your physics major.

Q: If I got placed into MATH 2, MATH 3C, or MATH 4C, or MATH 10A, how do I get into MATH 20A?
A: Please follow the Entry-Level Math Pathways to get to MATH 20A and ensure the best preparation for the entire MATH 20 series.

Q: If I got placed into MATH 2, MATH 3C, or MATH 4C, or MATH 10A, how do I fill the "MATH 18" space on my schedule for fall?.
A: Consider using the space in your schedule as follows:

- taking remaining GEs and/or university requirements;
- getting ahead in math requirements;
- taking courses for a second major and/or a minor;
- taking courses that will enhance your Knowledge, Skills, and Abilities (KSAs) in your target career field.

Q: Can I take PHYS 4 series courses in the summer to catch up on the standard 4-year plans?

A: No. The campus no longer allows us to offer PHYS 4A-B in summer.

Q: Do I need to report which Dept. provided plan I am following?
A: You do not need to report to PHYS which of the plans we have provided that you plan to follow. However, you should be cognizant that you are expected to follow a plan that would result in your graduating in normative time (4 years), if at all possible. If you need to extend your time-to-degree beyond normative time for any reason, campus approval is required to extend your time (a petition is required towards the end of your 4th year at UCSD).

Q: Can I move my required PHYSICS 4 series courses on my 4-year plan?
A: Each Physics 4 series course is typically offered only once per year and has prereqs, so you must enroll in accordance to one of our posted/provided plans for freshmen admits both in terms of the term listed and the order in which the courses must be completed.

Q: How many units should I take in fall of year 1?
A: All plans posted and provided by the Physics Department include comments explaining what major requirements can be moved/shuffled around. Please consult with your college about moving around GEs after scheduling your major requirements. Most colleges recommend 12-16 units per term for freshmen throughout year 1, but there may be cases in which a freshman admit needs/wants to take more units, and that can be OK as long as you end up doing well in all of the units you take. If you enroll in more than 12 units per term, be sure to carefully consider your load during weeks 1-4 and consult with the Physics-Advising team and your college ahead of the week 4 drop deadline if you think you may want to drop any classes.

Q: What happens if a course I want/need to take is completely full? Are any seats set aside that will be released for incoming student enrollment?
A: If the course is completely full, add yourself to the section with the shortest waitlist that fits your schedule (campus-wide, waitlisting begins during your 2nd enrollment appointment)**.** Check the website *of the dept. offering the course* to see if waitlist and/or seat-saving info. is posted. If not, reach out to *that dept.* through the VAC to inquire about how waitlisting and seat-saving goes. Keep in mind that each dept. has their own enrollment/waitlist/seat-saving policies and protocols and that you must adhere to each department's information. If you are unable to get into a required MATH course in the term you need it (eg. for meeting PHYS 4 series prereqs) you may need to switch to an alternate plan that accounts for this.

Q: Why does the PHYS 4 series begin in the winter and not the fall? Is it a good idea to just start out with math courses to prepare myself for physics? Or should I start taking physics courses during my first quarter? What can help prepare me for PHYS 4 and/or my other major courses?
A: PHYS 4 begins in winter instead of fall in order to give freshmen who do not come in with AP/IB/A-Level MATH a chance to meet the prereq for PHYS 4A, MATH 20A. Despite what some may think/feel, PHYS 4A assumes NO prior knowledge/background in physics. The only prereq for PHYS 4A is MATH 20A, so that is the only class you must have completed ahead of taking PHYS 4A (you are not required or expected to have taken any physics courses during your first quarter in order to be

ready for PHYS 4A in winter). Per the catalog, recommended preparation for PHYS 4A is: prior or concurrent enrollment in MATH 20B and a knowledge of vectors. Click here to see past syllabi from major-related courses. Completing all listed course prerequisites and recommended preparation will help you to be adequately prepared to succeed in your major-related courses.

Q: Where can I learn a bit more about the programming requirement, the level of programming required for the physics major, and when each programming course option is offered?
A: Please see the Programming Course Options.

Q: Can I change out of the physics major?
A: Yes. On/after the first day of instruction for fall term, you can use the **TSS Campus Tool** (not yet available) to request a change of major. Your request will be processed within 3-5 business days. If your proposed new major is a Selective Major, see the question directly below.

> **Q:** Can I change to a Selective Major (e.g. engineering, computer science, etc.)?
> **A:** Potentially (see link in the question), but since admission into a Selective Major is not guaranteed, it is essential that you stay on track in your physics major while preparing to apply to a Selective Major by taking the PHYS 4 series. If your proposed Selective Major requires the PHYS 2 series, first check that department's posted information to see if they accept the PHYS 4 series as a substitute. If you do not see anything that confirms the PHYS 4 series is accepted in place of the PHYS 2 series, contact that department through the VAC to inquire about this. If the selective major *does not* accept the PHYS 4 series in place of the PHYS 2 series, then you will need to take *both* the PHYS 4 and PHYS 2 series to stay on track in your physics major and prepare to apply to your selective major as, per all of our posted and provided information, PHYS 2 series courses are not accepted toward any physics majors and/or as prereqs for core UD physics courses (i.e. courses in the PHYS 100, 105, 110, 120, 130, and 140 series). If, for any reason, you fall off track with the PHYS curriculum you may need to extend your time-to-degree in order to catch up. The PHYS major requirements will not be waived/substituted due to a student falling off track for *any* reason.

Q: If I change to a major outside of physics can I change back to a major in physics?
A: Yes, but if your new major causes you to fall off track with the PHYS curriculum you may need to extend your time-to-degree in order to catch up. The PHYS major requirements will not be waived/substituted due to a late re-add of a major within our department.

Q: Can I have a double major with physics and a major in another department?
A: Possibly. For more on this, see the Double Major information and be sure to follow our instructions for filling out and submitting your Double Major Packet.

Q: Can I have a major in physics and a minor in another department?
A: Yes! For more on this, see the Plan for a Minor Outside of Physics information.

Q: What careers can I pursue with a degree in physics?

A: The possibilities are endless! Many students who have a B.S. in physics are hired as engineers. Others go on to pursue careers in computing, business, law, education, medicine, etc. Pursuing graduate education is also very common in advance of going into industry. For more on this, please see Careers for Physics Majors.

Q: How quickly can I get involved in research in the department?
A: As quickly as you secure a faculty mentor willing to take you on as a researcher or lab assistant, but keep in mind that most physics majors begin doing research in the sophomore or junior year. For more on this, please see Research & Related Internships.

Q: I took physics courses outside of UCSD - can they transfer to UCSD as Physics 4 series courses?
A: PHYS 4 is for the most part unique to UCSD-Physics and no transfer courses have ever been approved as equivalent to PHYS 4 (the one exception has been UC Davis' honors Physics series for their physics majors). AP exams also cannot count in place of PHYS 4 series courses, just as the Physics Dept. comments under the standard plans explain. If you took a course at another university that you think may be equivalent to UCSDs PHYS 4, please alert PHYSICS through VAC so we can guide you on potential next steps.

Q: What courses count as Physics Upper Division Restricted Electives (PHYS UD REs)?
A: Your Degree Audit shows the range of courses you can use for restricted electives for the major. Keep in mind the LIMIT OF USE rule in the major regulations section of your major checklist.

Q: How do I enroll in a course when the prereq was taken outside of UCSD but Admissions hasn't yet posted the transfer course to my record?
A: Proceed to the Enrollment Authorization System (EASy) to request preauthorization to enroll in the course. Attach to your EASy request a copy of your unofficial transcript (or exam score report) showing your grade in the transfer course so that you can be cleared to enroll. Make sure the transcript you submit with your EASy request includes your printed name, the printed name of the institution where the course/exam was taken, and the course/exam grade. Keep in mind that these requests are reviewed by academic departments. Academic departments don't have access to any of the material you sent to Admissions, and that's why you have to submit transcripts and score reports through EASy, so that the academic department can verify you've met the prereq and clear you to enroll.

Q: Are there any physics specific resources at UCSD?
A: There are plenty! Please proceed to the Table of Contents at the beginning of this handbook to see resources by topic. Before you start searching the entire handbook, please see the F*ive Steps Every Physics Major Should Take Early on in the Undergraduate Career*, directly below.

Five Steps Physics Majors Should Take Early on in their Undergraduate Career

This handbook is organized into sections (e.g., Double Majors, Research, Planning for Graduate School, etc.) that outline the key administrative steps of your undergraduate journey, which are the areas where staff advisors can provide the most guidance. Equally important, the steps below focus on the kind of planning only you can do. They will help you connect with faculty, graduate students, and peers, explore your academic interests in depth, and lay the groundwork for a physics experience that not only enriches your undergraduate years but also prepares you for future opportunities and success after graduation.

1: Explore the areas of physics! Go to the Physics Research Areas webpage to see the area(s) of physics you find interesting. This will help to give you a sense of what is available to you so that you can work to refine your own research interests.

2: Research our faculty! Look through the Physics faculty members at the link above and begin learning about their research area and associated project(s). You can click on each of their names to learn more about their specific research fields. This will help give you ideas of topics that you might want to look into as well as faculty you might want to speak to for more information about their research. You can use this as an opportunity to help figure out the possible research area(s) you would like to explore as an undergraduate and what, particularly, you might like to pursue after you graduate.

3: Get to know members of the Physics community! After going through the various research areas and learning about faculty research, you should be sure to interact with the faculty at department events (eg. attend dept. Seminars and other events we advertise throughout the year, participate in a "Dine/Coffee with a Prof or Graduate Student" event, etc.). See the faculty directory for contact information for faculty (note some professors listed have retired but will remain on the website). Engaging faculty will help you to develop your networking skills, give you an opportunity to discuss your interests and find out how they can help you to hone your skills and further develop your passion! You can talk with faculty about courses within and outside of physics that could help you to further explore their particular research area and/or prepare for research in that area. You can get guidance from faculty about various courses that will help supplement your physics major, which could potentially lead you to look into a double major and/or a minor.

> Note: Faculty do not tend to be overly familiar with the specific listing of offerings in other departments. Be prepared to get more general advice from faculty about topics of courses you can look up in the UCSD catalog. For example, a faculty member may tell you to take "Numerical Methods" but not know that corresponds to MATH 174 here at UCSD. Be prepared to do a google search for "UCSD [FILL IN TOPIC] to find courses matching topics faculty suggest you study.)

4: Explore other departments! For example, if you're thinking of a double major in MATH, go to the Department of Mathematics with the list of courses the faculty gave you to see which math majors include those courses. A double major in math includes far more courses than the faculty think is necessary, so then you can decide if you would like to proceed to adding a minor or major. You should also consult with MATH about the typical outcomes of the major you wish to pursue. If a double major and/or minor isn't preferred, still plan to take courses in other departments that our faculty recommend!

5: Seek advice from peers, graduate students and alumni! Learn about the research they are doing and how they are able to utilize and apply courses they took during their undergraduate years that helped them prepare for the work they're doing. You can click here for the list of contact information for graduate students and join the UCSD chapter of the Society of Physics Students (SPS) to quickly begin getting acquainted with current physics majors. Learn about research projects they participate(d) in during the undergraduate years - you may try similar projects so you can explore a research area! Join Tritons Connect and seek out connections on the UC San Diego Physics Department LinkedIn!

Majors

Physics prepares students for a wide variety of future options - see What Can I do with This Major?

Before declaring a major in Physics, it's best to learn about our department and programs! The Department of Physics offers undergraduate programs leading to the following degrees:

- BS, Physics (PY29)
- BA, Physics (PY35)

All majors with specializations were discontinued back in Winter 2025, and it has not been possible to declare a major w/ specialization after that date (those already in a specialization were permitted to retain it and graduate with it).

The physics major provides a core of basic education in several principal areas of physics, with sufficient flexibility to allow students to prepare either for graduate school or a career in industry.

How Much Math is Used in Physics?

Physics is fundamentally intertwined with mathematics, and this relationship is central to both the study and application of physical concepts. Here's a more detailed explanation:

1. **Mathematical Foundations**: At its core, physics relies on mathematics to describe and understand the natural world. Mathematical equations and models are used to express physical laws, from Newton's laws of motion to quantum mechanics. This means that a deep understanding of advanced mathematical concepts is crucial for students. For instance,

calculus is essential for analyzing changes in physical quantities, differential equations are used to model dynamic systems, and linear algebra is important for understanding quantum states and various physical transformations.

2. **Quantitative Problem Solving**: Physics problems often require precise and detailed quantitative solutions. Students must be adept at manipulating algebraic equations, working through complex integrals, and solving differential equations. This quantitative approach is necessary for deriving predictions and understanding phenomena at both macroscopic and microscopic scales.
3. **Conceptual Application**: Beyond theoretical understanding, students must be able to apply mathematical techniques to physical scenarios. For example, when studying classical mechanics, one needs to apply vector calculus to understand motion in three dimensions. In electromagnetism, Maxwell's equations—fundamental to the theory—are expressed using advanced calculus and vector analysis. Applying these mathematical concepts correctly is essential for accurate modeling and problem-solving.
4. **Rigorous Proofs and Derivations**: Physics often involves deriving results and proving theorems. This requires a rigorous approach to mathematical proofs and derivations. Students need to not only understand the steps involved but also why each step is necessary and how it connects to the broader physical context.
5. **Complex Models and Simulations**: Modern physics frequently involves complex models and simulations that rely on numerical methods and computational techniques. Students may need to write code or use sophisticated software to solve equations that cannot be addressed analytically. This requires a strong grasp of both the underlying mathematics and the computational tools used to implement it.
6. **Interdisciplinary Knowledge**: Physics often intersects with other disciplines, such as engineering and computer science, where additional mathematical skills may be required. For example, in theoretical physics, knowledge of complex variables and tensor analysis can be crucial, while in experimental physics, statistical methods are used to analyze data and interpret results.

In summary, studying physics is mathematically challenging and rigorous because it demands a deep understanding of various mathematical concepts, the ability to apply these concepts to physical problems, and the skills to perform complex calculations and derivations. This mathematical rigor is essential for developing accurate models, making predictions, and advancing our understanding of the physical universe.

At minimum, students must successfully complete MATH 18, 20A-B-C-D-E as part of their physics major and as prereqs for the PHYS 4 series. All physics majors are strongly encouraged to take MATH 120A. You can click here to see recommended MATH courses by research area, as well.

The Phasing out of Majors with Specializations

Effective Fall 2025, physics majors with specializations are discontinued. Students can pursue a B.S. Physics degree (PY29) or a B.A. Physics degree (PY35). Students enrolled in a degree program at the time it was discontinued are permitted to remain in the degree program and complete it. These students must refer to their degree audit for a list of the requirements.

The B.S. Physics degree (PY29) now includes optional focus areas:

- Astrophysics: PHYS 160, 161, 162, 225A-B-C, 227, 228; ECE 120; MAE 180, ASTR 123, 150
- Biophysics: PHYS 140B, 173, 175, 176, 177, 178; BI** 100–185; CHEM 100–186. The following courses are not accepted: BISP courses, BIEB 176, CHEM 130.
- Computational physics: PHYS 105B, 141, 142; MATH 170A-B-C, 179, 183
- Materials physics: PHYS 133, 152A-B; CHEM 120A-B; ECE 103, 134, 135A-B, 136L; MAE 160
- NEW (Catalog does not yet show): Physics of the Earth, Oceans, and Atmosphere: PHYS 105B, 110B, 116, 122, 140B; SIO 103, 111, 171, 172, 177

Differences between the BS and BA Degree

Bachelor of Arts (BA):
A BA degree—whether in Physics or another field—emphasizes critical thinking, communication, and analytical skills. The curriculum is broader and more flexible, with fewer advanced physics core requirements and a higher number of "self-select" courses, including up to four upper-division electives from departments outside of Physics.

For example, BA students are not required to take advanced courses such as PHYS 105A or PHYS 140A, and PHYS 130B is not part of the standard BA curriculum. This makes the BA a good fit for students who want exposure to physics but don't plan to pursue graduate studies in the field. It also works well for students interested in pairing physics with another discipline, or in industries where a combination of physics knowledge and broader skills is valuable.

Bachelor of Science (BS):
A BS degree focuses more heavily on mathematics, laboratory work, research methods, and data analysis. The program is structured, with a stronger emphasis on advanced physics core topics and fewer electives outside the department (up to three "self-select" courses if you choose one of our optional focus areas).

Students pursuing the BS will complete advanced courses such as PHYS 105A (105B strongly recommended), PHYS 130B (130C strongly recommended), and PHYS 140A (140B strongly recommended). This degree path is designed for students who want deeper preparation for graduate studies in physics or technical careers requiring advanced physics knowledge.

Planning for Your Future:

- **Graduate school in physics?** The BS is the right choice, giving you the foundation to explore research areas, determine whether you lean toward theory or experiment, and build connections with faculty, graduate students, and peers.
- **Technical industry career?** Either degree can work, but you'll want to focus on developing tangible skills through coursework and research that align with your career interests.
- **Non-technical or interdisciplinary paths?** A BA may be sufficient, especially if paired with other fields of study that support your goals.

Advice for All Students:
Stay open-minded and let your interests guide you. You don't need to commit to one area of physics right away—use your time to explore different labs, projects, and coursework. Building relationships with professors, postdocs, graduate students, and peers will give you invaluable mentorship and insight into possible pathways. If you're not sure where your passion lies yet, use the early years to test out different directions and see how physics fits into your larger academic and career goals.

Changing Between the BA and BS in Physics

To change between a BA and BS in Physics, use the **TSS Campus Tool** (not yet available). Please note:

- To propose a double major, follow the Instructions for Filling Out & Submitting the Double Major Packet.
- Majors w/ Specializations have been retired. It is no longer possible to declare a Physics major w/ a Specialization.
- Transfer admits must adhere to the Transfer policies here.

Pathways through Physics

The standard academic plans and alternate academic plans represent the established pathways for completing the Physics major. **Students must select and follow one of the Department's published plans.** Students enter the program with different academic backgrounds and completed coursework, particularly at the point of transfer, so the appropriate plan may differ from student to student. The plans provide different pathways for completing the Physics major, including options for completing different Physics electives. Which electives can be incorporated into a particular plan, and when they can be taken, depends on course prerequisites, sequencing, and the Department's schedule of course offerings.

Students should review Physics plan webpages and documents from top to bottom and should not stop after reviewing the quarter-by-quarter section. The information provided below the

quarter-by-quarter plan explains how the plan should be used and includes important guidance about course sequencing, MATH requirements, and opportunities to move, remove, or rearrange courses where flexibility exists.

The *core* Physics curriculum is intentionally structured and sequenced. Required core PHYS courses must be completed according to the established curriculum, based on the Department's course prerequisites which are all strictly enforced without exception (see policies), and schedule of course offerings. The published plans are constructed around these curricular requirements and constraints. There are no alternate pathways that allow students to bypass required core courses or their established sequencing. A student's prior coursework may therefore result in more or less room in one or more terms than shown on a plan. This does not, by itself, indicate a problem with the student's academic plan or with the Physics curriculum. **Students may adjust courses within a published plan only where permitted by the curriculum. They may not combine elements of different plans or create an independent pathway in order to accommodate a preferred combination of electives and time-to-degree.**

A **major is one component of a UC San Diego degree, not the entirety of the requirements for graduation**. Students must complete their major requirements as well as College, university, and other applicable degree requirements. The Physics major is therefore not designed or required to fill every term with major coursework or to create a full-time course load in every term. Whether a student needs or chooses to maintain full-time enrollment is separate from the requirements of the Physics major. When a student has fewer Physics requirements remaining in a particular term, the Department does not add additional coursework or alter the curriculum simply to fill available space. Students should instead consider their complete degree requirements when planning each term and can use available space to make progress toward other degree requirements or their academic goals. The Department's How to Use Free Space guidance provides ideas for making productive use of terms with fewer major requirements.

Students may enter or begin the Physics major at different points in their academic careers. Transfer students may have completed some, but not all, recommended preparation before entering UC San Diego, while students who begin the major after their first year may need to select a different Department plan to account for courses they have not completed. In all cases, students are responsible for completing the remaining requirements for their degree, and the selected plan must be followed within the established prerequisites, course offerings, and sequencing of the Physics curriculum.

Students should consider their completed coursework, overall degree requirements, academic goals, and desired time-to-degree when determining which Department plan applies to their circumstances. Students for whom a particular time-to-degree is a primary consideration should review the available plans and their remaining requirements early in their academic planning. If a student's academic goals or desired timeline are not well aligned with the established Physics pathways, they may wish to consider whether another major would provide a pathway that better aligns with those goals.

Major Checklists

The degree audit serves as the major checklist which displays the number of lower division and upper division units and courses required for each major. Please note:

To uphold the standards of the physics degree program, strict enforcement of the major requirements and enrollment policies will be implemented to ensure the integrity of the academic curriculum and ensure student success throughout and beyond the undergraduate years.

Frequently Asked Questions about the Physics Major

The following information is for current Physics majors, only.

Q: Where can I see a description of each PHYS major/specialization?
A: Please see the *Physics Curriculum* section of the UCSD catalog for this type of information.

Q: Where can I see titles, descriptions, and prerequisites for each PHYS major requirement?
A: Please see the *Courses* sections of the UCSD catalog for this type of information (eg. click here to see the Physics Courses section of the catalog).

Q: Where can I see qtr-by-qtr plans for the physics majors?
A: Physics majors are required to follow a plan provided to them by the Physics Department for completion of the major requirements. Click here to see all *standard* qtr-by-qtr plans and click here to see all *alternate* qtr-by-qtr plans. Since summer offerings of PHYS 4A-B are never guaranteed, the Physics Department does not post plans that include the summer offerings of PHYS 4A-B. When PHYS 4A-B are offered in summer, students can use them to catch up in the PHYS 4 series on the plans we provide:

Fall	**Winter**	**Spring**	**Summer Session 1**	**Summer Session 2**
		MATH 18*	**PHYS 4A**	**PHYS 4B**
		MATH 20A**	MATH 20B**	MATH 20C**

**MATH 18 may be moved but must be taken no later than Summer Session 2.*
***MATH 20A, 20B, 20C can be moved earlier, but not later than is listed.*

Please contact Physics through the Virtual Advising Center (VAC) for questions/concerns about qtr-by-qtr planning in Physics.

Q: How can I complete the PHYS 4 series for my physics major?
A: As the standard academic plans show, there are two pathways through Physics 4:

The standard PHYS 4 pathway is designed for freshman admits:

Fall	**Winter**	**Spring**
MATH 18*	PHYS 4A	PHYS 4B
MATH 20A	MATH 20B	MATH 20C
Fall	**Winter**	**Spring**
PHYS 4C	PHYS 4D	PHYS 4E
MATH 20E	MATH 20D	

**MATH 18 may be moved but must be taken no later than Summer Session 2 (it is a prereq for PHYS 4C).*

The accelerated PHYS 4 pathway is designed for anyone transferring into a physics major from outside of UCSD (i.e. transfer admits), as well as students who declare a physics major after completing most of the PHYS 2 series:

NOTE: Prior completion of "Transfer Major Prep" courses MATH 18 + 20A-B-C + PHYS 2A-B-C is required to be eligible to follow the accelerated PHYS 4 pathway.

Fall	**Winter**	**Spring**
PHYS 4C	PHYS 4D	PHYS 4E
MATH 20E	PHYS 4A	PHYS 4B
	MATH 20D	

Q: How can I complete the core UD requirements for my physics major?
A: As the standard academic plans show, there are two pathways through the core UD requirements:

The standard core UD course pathway

Fall	**Winter**	**Spring**

PHYS 100A (BS & BA)	PHYS 100B (BS & BA)	PHYS 120 (BS & BA)
PHYS 110A (BS & BA)	PHYS 105A (BS)	PHYS 130A (BS & BA)
Fall	**Winter**	**Spring**
PHYS 130B (BS)		
PHYS 140A (BS)		

The accelerated core UD course pathway

Fall	**Winter**	**Spring**
		PHYS 120 (BS & BA)
Fall	**Winter**	**Spring**
PHYS 100A (BS & BA)	PHYS 100B (BS & BA)	PHYS 130B (BS)
PHYS 110A (BS & BA)	PHYS 105A (BS)	PHYS 140A (BS)
	PHYS 130A (BS & BA)	

Q: How do I switch to the current requirements without changing my physics major/specialization?
A: Follow these steps to switch to the current requirements:

1. Log into the VAC
2. Click "Ask a Question"
3. In the "Topic" dropdown list, select "Major"
4. In the "Direct to: dropdown list, select "Physics"
5. In the "Question" box, type "I'd like to change to the current requirements for my physics major/specialization because ____FILL IN THE BLANK____." *Note: We are asking you to explain the reason behind your request so that we have feedback on why students prefer the new requirements over the old ones.*

6. Select your notification preferences (we recommend you always ask for a text message notification).
7. Submit your VAC message. It can take approximately 7-10 business days for your request to be fully processed and for your Degree Audit to correctly reflect your progress under the current requirements.

Q: I believe there's an error in the major requirements section of my Degree Audit. How can I have the audit reviewed/updated?
A: Contact Physics through the VAC to report the error so that we can have it fixed.

Q: I want to change my major from Physics to something in another Department. Can I use my PHYS 4 series courses in place of PHYS 2 series requirements in another department?
A: Each Department has sole authority over the courses they will/won't accept toward their degree. The PHYS 2 and 4 series **are not** equivalent (the 4 series is more advanced, has more topics than PHYS 2, etc.). The following should be noted about topics:

- PHYS 2A is most similar to 4A
- PHYS 2B is most similar to 4C
- PHYS 2C is most similar to 4B
- PHYS 2D is most similar to the combo of PHYS 4D + PHYS 4E

Q: Is the Degree Audit the authority on my degree requirements and progress toward graduation?
A: No, the degree audit is not the authority on your degree requirements and/or progress. Per the posted campus information about the Degree Audit, "The General Catalogue is the official repository of the curricular requirements for degree audits. If there are inconsistencies between the General Catalogue and the Degree Audit, the General Catalogue shall be deemed correct. Any errors on the Degree Audit do not automatically grant students an exception to their degree requirements. If you discover an inconsistency, report it to the Advising Staff."

Students are responsible for contacting PHYSICS through VAC to report any suspected errors in the PHYS MAJOR section on the Degree audit. Contact PHYSICS through VAC if you would like the Department to review the PHYS MAJOR section of your degree audit.

Q: Why are most physics courses offered only once per year?
A: Several factors impact the number and type of annual course offerings. Due to the size of the population of physics majors, as well as the faculty FTE, the department can only justify one annual offering of most courses. The slight expansion to include extra offerings of PHYS 130A-B and 140A stretched dept resources to capacity and also added duplicates where they seemed most needed based on data of student grades, needs for repeats, and granted the greatest additional flexibility in the curriculum for the highest percentage of students.

Q: Why aren’t core UD PHYS courses offered in summer?
A: The campus funds summer in a different way than courses are funded during the regular academic year, leading to requirements the department cannot possibly meet for any core UD

offerings. Therefore, we are prevented from offering core UD PHYS courses during any summer session.

Q: Why must core UD courses be completed in-residence?
A: To be awarded a degree owned and operated by the Physics Department at *UC San Diego Physics*, students **must** complete a minimum number and type of courses in residence in the Physics Department at UC San Diego.

Q: Why don't you have remote options for physics courses?
A: The physics faculty state that physics is best taught, learned, and assessed in-person.

Exceptions to Major Requirements/Regulations *(for current physics majors only)*

Click here to see policies and protocols for exceptions to the major requirements and regulations.

Major Regulations

Click here to see the regulations physics majors must adhere to.

Changing a Major Within Physics

Students can switch between the BS and BA in Physics up until they file to graduate. In thinking about when to change, students should keep in mind the requirements for their new major within physics to ensure they would not need to extend their time-to-degree beyond normative time to complete the new major within physics (that said, a student can request to change their major within physics even if it would result in an extension to their time-to-degree (approval of the request is not guaranteed)).

Changing to a Major Outside of Physics

Click here to learn about changing to a non-selective major outside of the Physics Department. Non-selective majors students often consider:

- **STEM:** Astronomy & Astrophysics, Mathematics, Cognitive Science, Economics
- **Non-STEM:** History, Political Science, Visual Arts

Click here to learn about changing to a Selective major outside of the Physics Department. Since admission into a *Selective major* is not guaranteed, it is essential that you stay on track in your physics major while preparing to apply to a Selective Major by taking the PHYS 4 series. If your proposed Selective Major requires the PHYS 2 series, first check the department's posted information to see if they accept the PHYS 4 series as a substitute. If you do not see anything that confirms the PHYS 4 series is accepted in place of the PHYS 2 series, contact that department through the VAC to inquire about this. If the selective major *does not* accept the PHYS 4 series in place of the PHYS 2 series, then you will want to make sure to take *both* the PHYS 4 and PHYS 2 series. If, for any reason, you fall off track with the PHYS curriculum you may need to extend your time-to-degree in order to catch up. The PHYS major requirements will not be waived/substituted due to a student falling off track for *any* reason.

Programming Course Options

Effective W25, PHYS 41 is the programming course expected for PY29 majors. PY29 students should click here to see who is eligible for an exception; eligible students must contact PHYSICS through VAC to have the exception applied.

For majors w/ specializations and those eligible for exceptions: Choose one course from CENG/NANO 15; COGS 18; CSE 8A, 11, 12; ECE 15; MAE 8; PHYS 41. Course descriptions are included below and you will notice that the courses are all lower division; most courses are introductory. It is recommended that the programming requirement be completed as early as possible, but the requirement may be completed anytime during the undergraduate years. Currently, python is the most popular programming language in STEM, followed by MATLAB. See Research Skills for related information about programming. PHYS 41 does not require prior knowledge, skills, and/or abilities in programming, helps prepare students for core and non-core UD PHYS courses (e.g., PHYS 105A-B, 141, 142, etc.), and helps prepare students for research in PHYS.

You must check with the dept. offering the course to see what term(s) the course is offered (start by looking for their annual schedule of course offerings on their dept. website).

!NEW! This course is expected of physics majors because it's designed for our students with our curriculum in mind.

PHYS 41. Scientific Computing with Python (4) OFFERED WINTER, ONLY

This course is designed for students concurrently enrolled in the Physics 4 series and is an introduction to computer programming and scientific computing with Python. The course covers basic data structures and operations in Python and how to write and debug functions. These tools are then applied to scientific computing, including data analysis and visualization, numerical computations, and

simulations. ***Prerequisites:*** MATH 20A. Recommended preparation: Prior or concurrent enrollment in Physics 4A.

CENG 15: Engineering Computation Using Matlab (4) (Cross-listed with NANO 15) Introduction to solution of engineering problems using computational methods. Formulating problem statements, selecting algorithms, writing computer programs, and analyzing output using MATLAB. Computational problems from nanoengineering, chemical engineering, and materials science are introduced. The course requires no prior programming skills. Students may only receive credit for one of the following: CENG 15, CENG 15R, NANO 15, or NANO 15R.

NANO 15. Engineering Computation Using MATLAB (4)
Introduction to the solution of engineering problems using computational methods. Formulating problem statements, selecting algorithms, writing computer programs, and analyzing output using MATLAB. Computational problems from NanoEngineering, chemical engineering, and materials science are introduced. The course requires no prior programming skills. Cross-listed with CENG 15. Students may only receive credit for one of the following: NANO 15, NANO 15R, CENG 15, or CENG 15R.

COGS 18. Introduction to Python (4)
This class will teach fundamental Python programming skills and practices, including the “Zen of Python.” Students will focus on scientific computing and learn to write functions and tests, as well as how to debug code using the Jupyter Notebook programming environment. Students may receive credit for one of the following: COGS 18, CSE 8A, or CSE 6R. Recommended preparation: students with limited computing experience may take COGS 3. *(Note from PHYS: Students report this course is not as rigorous as some of the other LD Programming options.)*

CSE 8A. Introduction to Programming and Computational Problem-Solving I (4)
Introductory course for students interested in computer science and programming. Basics of programming including variables, conditionals, loops, functions/methods. Structured data storage such as arrays/lists and dictionaries, including data mutation. Hands-on experience with designing, writing, hand-tracing, compiling or interpreting, executing, testing, and debugging programs. Students solve relevant computational problems using a high-level programming language. CSE 8A is part of a two-course sequence (CSE 8A-B) that is equivalent to CSE 11. Students should take CSE 8B to complete the CSE 8A-B track. Students who have taken CSE 8B or CSE 11 may not take or receive credit for CSE 8A. Students may receive credit for one of the following: COGS 18, CSE 8A, or CSE 6R. Recommended preparation: No prior programming experience is assumed, but comfort using computers is helpful. Students should consult the “CSE Course Placement Advice” web page for assistance in choosing which CSE course to take first. ***Prerequisites:*** restricted to undergraduates. Graduate students will be allowed as space permits.

CSE 11. Introduction to Programming and Computational Problem-Solving: Accelerated Pace (4)

Accelerated introductory programming including an object-oriented approach. Covers basic programming topics from CSE 8A including variables, conditionals, loops, functions/methods, structured data storage, and mutation. Also covers topics from CSE 8B including the Java programming language, class design, interfaces, basic class hierarchies, recursion, event-based programming, and file I/O. Basics of command-line navigation for file management and running programs. Zero units of credit offered for CSE 11 if CSE 8B taken previously or concurrently. Recommended preparation: Significant prior programming experience (for example, high school AP CSA). Students should consult the "CSE Course Placement Advice" web page for assistance in choosing a first CSE course. ***Prerequisites:*** restricted to undergraduates. Graduate students will be allowed as space permits.

CSE 12. Basic Data Structures and Object-Oriented Design (4)
Use and implementation of basic data structures including linked lists, stacks, and queues. Use of advanced structures such as binary trees and hash tables. Object-oriented design including interfaces, polymorphism, encapsulation, abstract data types, pre-/post-conditions. Recursion. Uses Java and Java Collections. ***Prerequisites:*** CSE 8B or CSE 11, and concurrent enrollment with CSE 15L; restricted to undergraduates. Graduate students will be allowed as space permits.

ECE 15. Engineering Computation (4)
Students learn the C programming language with an emphasis on high-performance numerical computation. The commonality across programming languages of control structures, data structures, and I/O is also covered. Techniques for using MATLAB to graph the results of C computations are developed. ***Prerequisites:*** a familiarity with basic mathematics such as trigonometry functions and graphing is expected but this course assumes no prior programming knowledge.

MAE 08. MATLAB Programming for Engineering Analysis (4)
Computer programming in MATLAB with elementary numerical analysis of engineering problems. Arithmetic and logical operations, arrays, graphical presentation of computations, symbolic mathematics, solutions of equations, and introduction to data structures. ***Prerequisites:*** MATH 20A and 20B or consent of instructor. *(Note from PHYS: Students report this course is very rigorous.)*

Physics Course Offerings by Term

To see the full catalog of physics courses, see the Physics Courses section of the catalog. To see the tentative *schedule* of physics course please click here.

How to Plan Your Schedule

Based on the unique schedule of core course offerings and our strictly enforced prereq policies, there are limited pathways through our program and these are all defined in our posted information.

STEP 1: Select a Plan Posted/Provided by the Physics Department based on your incoming coursework

Physics majors ARE NOT permitted to follow self-drafted plans, as all pathways through the major have been spelled out in existing posted plans. In most cases, you will be following one of the Standard Plans for your PYXX major.

Your Department provided plan already includes all required courses on the Current Major Checklists and required *core* physics courses are appropriately scheduled based on the listed prereqs and our schedule of course offerings. As the catalog shows, the prereqs for core physics courses are as follows:

Course	Term Offered	PREREQ(S)
PHYS 4A	Winter	MATH 20A
PHYS 4B	Spring	MATH 20AB + PHYS 4A
PHYS 4C	Fall	MATH 20ABC + MATH 18 + PHYS 4AB
PHYS 4D	Winter	MATH 20ABCE + MATH 18 + PHYS 4ABC
PHYS 4E	Spring	MATH 20ABCDE + MATH 18 + PHYS 4ABCD
PHYS 2CL	Fall, Winter, Spring, Summer II	PHYS 2A or 4A + PHYS 2B or 4C
PHYS 2DL	Fall	PHYS 2BL or 2CL
PHYS 4A	Winter	MATH 20A
PHYS 100A	Fall	MATH 20ABCDE + MATH 18 + PHYS 4ABCD
PHYS 100B	Winter	PHYS 100A + MATH 20ABCDE + MATH 18
PHYS 110A	Fall	MATH 20ABCDE + MATH 18 + PHYS 4ABCD
PHYS 105A	Winter	MATH 20ABCDE + MATH 18 + PHYS 4BCDE
PHYS 120	Spring	PHYS 4ABC + PHYS 2CL
PHYS 130A	Winter, Spring	PHYS 4ABCDE + PHYS 100A + PHYS 110A
PHYS 130B	Fall. Spring	PHYS 130A + PHYS 100B
PHYS 140A	Fall, Spring	PHYS 130A

- **Freshman admits:** If you are ahead in your lower division math requirements, you *are* permitted to take your lower division math courses early, but you cannot take them later than when they'll be used as prereqs for PHYS 4. Continue reading for more on this). If you are **unable** to follow one of the standard plans for completing the major requirements, you will need to follow one of the Alternate Plans for Physics.

- **Transfer admits:** If you are a *transfer* admit and you are unable to follow one of the standard/alternate plans, you must immediately alert PHYSICS through VAC - a plan will be provided to you.

Remember, Physics majors must take the entire Physics 4 series for their physics major. Physics majors with AP/IB/A-Level and/or transfer courses equivalent to Physics 2 series lecture courses are not exempt from these topics in the 4 series; physics majors will need Physics 4A-B-C-D-E. The

Department exclusively accepts the Physics 4 series lecture courses as prereqs for all core UD physics courses (the 2 series lecture courses are not accepted). **This policy will apply to every student seeking to enroll, not just physics majors, no matter the term/year when they began at UCSD.**

STEP 2: Select and Schedule the Major Requirements You Must Self-Select

Physics majors have a wealth of options for the requirements they must self-select (e.g., LD Breadth, PHYS UD Lab, PHYS UD Depth, and/or PHYS UD REs). This is why the **Department Comments** below the qtr-by-qtr section of Physics plans indicate *these courses may be moved/shuffled on the plan*. Which classes best suit you will be based on your interests and which courses will help you develop the knowledge, skills, and abilities (KSAs) that will help you prepare for the future you're working toward. Explore courses in the catalog and consult with faculty to discuss skills various courses teach so that you can make informed decisions about which courses would best suit you and your goals.

Use the following schedule planning resources to properly schedule the major requirements that you must self-select (e.g., LD Breadth, PHYS UD Lab, PHYS UD Depth, and/or PHYS UD REs):

- The Degree Audit showing your major requirements and progress
- The Standard Academic Plan you are following OR the Alternate Academic Plan you are following
- The Course Descriptions & Prerequisites (keep in mind you must complete prereqs *as listed*)
- The Schedule of Physics Course Offerings.
    - For offerings in other depts, check *their* websites: BIO, CENG/NANO, CHEM, CSE, ECE, MAE, MATH, SIO
- The Typical Course Frequency and Term(s) (to see when we'll typically offer a course in the upcoming year(s))
- Course recommendations by Faculty
- Policies for undergraduates seeking to take graduate level courses

STEP 3: Work with your College to Plan Non-Major Requirements

When working with your college, discuss with them any interest you have in spreading your GEs and university requirements across your undergraduate years to allow for the most balanced schedule, or in completing GEs and university requirements as early as possible to leave a lot of space in your later undergraduate years for things like research.

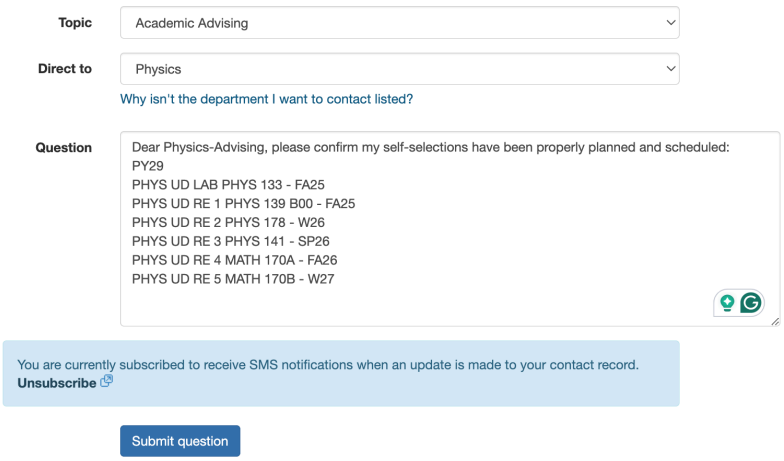
Having a Qtr-by-Qtr Plan Reviewed

Because physics majors are *required* to select and follow a plan that has been posted/provided by the Physics Department, we **will not** review a qtr-by-qtr plan to confirm that *core* courses have been properly scheduled. Note:

- For help selecting a plan, see How to Plan Your Schedule.
- For students taking LD MATH courses ***early***, there is nothing the Department needs to check/verify.
- Remember to cross out any requirements on the plan that you have already completed. See How to Use "Free" Space in Your Schedule.

Because physics majors *must* self-select and schedule the PHYS UD LAB, PHYS UD DEPTH, and PHYS UD REs, **we will** review your proposed selections and scheduling of these courses. **Please note this process is completed through VAC instead of during an appointment.** To have your proposed course and proposed terms of self-select requirements checked, follow these steps:

1. Proceed to the "Ask a Question" feature in VAC and select the Physics Department as the Recipient of your message.
2. Copy and paste into the message the appropriate block *below* step 4.
3. Replace [COURSE SUBJECT CODE AND NUMBER] and [TERM/YEAR] with your selections.



   Here's an example:
4. Submit your VAC message and be on the lookout for our reply with feedback on your selections.

PY26
PHYS UD LAB [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD DEPTH 1 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD DEPTH 2 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]

PHYS UD RE 1 [COURSE NUMBER] - [TERM]/[YEAR]
PHYS UD RE 2 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]

PY28
PHYS UD LAB [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD REs must be planned in consultation with SIO Dept.

PY29
PHYS UD LAB [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 1 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 2 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 3 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 4 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 5 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]

PY32
PHYS UD LAB [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 1 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 2 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 3 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]

PY33
PHYS UD LAB [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 1 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 2 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]

PY34
PHYS UD LAB [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD DEPTH 1 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD DEPTH 2 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 1 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 2 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 3 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]

PY35
PHYS UD RE 1 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 2 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 3 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 4 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 5 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 6 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]
PHYS UD RE 7 [COURSE SUBJECT CODE AND NUMBER] - [TERM]/[YEAR]

How to Use “Free” Space in Your Schedule

Consider...

- taking remaining GEs and/or university requirements;
- getting ahead in math/physics requirements for your major, prereqs permitting;
- taking courses for a double major and/or a minor;
- taking courses that will enhance your Knowledge, Skills, and Abilities (KSAs) in your target career field;
- looking for research that could result in enrollment in a Special Studies 99, 199, or 199H course under the supervision of a faculty member;
- Enrolling as a part-time student.

How to Find Supplemental Courses Applicable to My Field

The major checklists include courses that can be taken to apply to the major, as well as a note indicating the possibility to petition non-listed courses, and sometimes students may want to take courses in excess of the major requirements in order to further develop their knowledge, skills, and abilities (KSAs) in their target field/area. The challenge sometimes comes in finding potentially applicable courses. Here are some ways you can search for potentially applicable courses:

- Review the Courses section of the catalog for relevant departments (this is likely where dept. staff will refer you to if you ask them but if there are any new and/or special topics courses being offered in upcoming terms, they might know)
- Search department directories (eg. the Physics Directory) for faculty doing research in the relevant area and contact those faculty to inquire about courses they know about that could be helpful
- Do a Google search for the topic and see if any courses come up (or any leads that can help you eventually find faculty to speak to about courses that could be helpful)
- Ask fellow students (eg. post a question in the SPS Discord and see what other students know), and speak to graduate students (e.g. at department events that bring together undergrads and grads, during TA office hours, etc.)
- Check the next section of this handbook to see if faculty have already proposed some suggestions

Course Recommendations by Physics Faculty

The faculty have come up with various ways to display course recommendations! You can click here to see recommended MATH courses by research area (there is also a tab for supplemental BIO courses for biophysics students). then read the sections above and below here in the handbook for some additional advice and information. For further advising, seek Faculty Advising (not Staff advising) since your questions pertain to the content of physics and the content of physics research.

Substitute Physics Courses

To see courses physics majors have previously petitioned to apply to the major requirements, please see the Past Major Course Exceptions sheet. Also check the Special Exceptions to the Major Requirements During the Pandemic.

Frequently Asked Questions (FAQs) About Low Grades & How They Impact Major Progress

Read each Q&A to ensure you know how low grades impact your upcoming enrollments, progress, and status in the major.

Q: How will a low grade impact my status at UCSD?
A: Please click here to learn more about this. Please note that your college is the point of contact for followup questions on this matter.

Q: How will a low grade impact my visa if I am an international student?
A: Please click here to learn more about this. Please note that ISEO is the point of contact for followup questions on this matter.

Q: How will a low grade impact financial aid?
A: Please click here to learn more about this. Please note that Student Financial Solutions is the point of contact for followup questions on this matter.

Q: Can I use a D grade as a prereq?
A: According to campus policy, a grade of D can be used to meet prerequisites for subsequent courses. However, the Physics Department faculty strongly recommend against using a D grade as a prerequisite for future coursework. A D grade suggests insufficient mastery of the material, which may hinder success in more advanced courses. Ref. the Physics Department Enrollment Policies.

Q: Can I use a D grade toward my PHYS major?
A: While D grades allow students to enroll in subsequent PHYS and MATH courses, they cannot be applied to major requirements, not even via petition, under any circumstances. As a result, any courses in which a D grade is earned must be repeated before graduation and a C- or higher must be earned in order to meet the requirements for the Physics major. Refer to the Major Regulations.

Q: Can an F or NP grade satisfy a major requirement?
A: F and NP grades cannot apply to physics major requirements, so you must repeat the major requirement for a letter grade and earn a grade of C- or above. Refer to the Major Regulations.

Q: Can an F or NP grade satisfy prereqs?
A: F and No Pass (NP) grades cannot be used to satisfy prerequisites. During weeks 1 and 2 of the term, the campus conducts a "Missing Prerequisite" check and will drop students from courses if their prerequisites include F or NP grades. Instead of waiting for the campus to drop you from a class you're no longer eligible for, drop yourself and update your schedule to ensure (1) you achieve full-time status (or apply for part-time status) and, (2) that you have Canvas access for all of your new enrollments by the time the term begins (or as soon as possible after the term has started).

Q: Can I retake a course via Credit by Exam, retake the final exam, do extra work to raise my grade, or repeat the course remotely?
A: Based on campus and departmental policies, none of these options are available.

Q: How will my plan change if I receive an F grade in a core major requirement needed before I'd have time to repeat it?
A: With the exception of PHYS 41, which is not a prereq for other core PHYS courses, the F grade will prevent you from moving forward in the core PHYS program. Though you can continue in non-core major courses you are eligible for based on the listed prereqs, you will need to select an alternate plan you are eligible for and repeat the year the failed core course is in.

Q: Can I stay on my current plan, despite my low grade?
A: A low grade in a core LD or core UD course suggests a student *should not* continue with their existing standard plan or alternate plan. However, depending on the course and the specific grade, continuing on the existing plan may be possible. In some cases, you may need to repeat a particular year on a particular plan. Check prereqs, schedule of offerings, and info. below and then seek Physics-Advising for any follow up questions. Struggling students should strongly consider selecting an updated alternate plan that includes UD Quantum (PHYS 130A) starting in SPRING, and spreading any PHYS UD REs over the full year ***after*** PHYS 130A. If you are double majoring, it would be wise to consider a single major, only, as our faculty indicate it is MUCH better to be a stellar student in a single major than a mediocre (or poor) student in a double major.

Q: If I earned a D grade and decide to use it as a prereq, can I repeat courses from one year on my plan alongside courses from subsequent years on my plan?
A: Course conflicts may arise for students taking courses that are not expected to be taken concurrently, and you need to factor this in when planning to repeat classes (see chart below). To ensure the best outcome, even if the prereqs would allow you to move forward (eg. based on a D grade), you are strongly advised to repeat *before* moving forward in the core PHYS program.

Fall	Winter	Spring
4C and/or 2CL may conflict with: 2DL, 100A, 110A, 122, 130B, 140A,	**4A and/or 4D and/or 2CL and/or 39L and/or 41 may conflict with:** 100B, 105A,	**4B and/or 4E and/or 2CL may conflict with:** 100C, 105B, 130A, 130B, 140A, JR/SR

JR/SR non-core courses	110B, 124, 130A, 130C, 140B, JR/SR non-core courses	non-core courses
2DL may conflict with: 130B, 140A, SR non-core courses	**100B may conflict with:** 130C, 140B, SR non-core courses	**130A may conflict with:** 130B, 140A, SR non-core courses
100A and/or 110A may conflict with: 130B, 140A, SR non-core courses		

Q: Will my plan be affected if I do not pass a LD math class if I'm ahead in math on my academic plan?

A: Your plan will only be affected if you do not successfully complete the class before you need it per your plan.

Q: How can I make meaningful progress at UCSD, despite a low grade in a core major requirement?

A: Consider *non-core* courses needed for the major, non-major requirements (including but not limited to courses for your GEs, university requirements, a double major, and/or a minor, and/or courses that help you develop knowledge, skills, and abilities (KSAs) in your target career field).

Q: If, based on the course I need to repeat due to a low grade, I don't need any classes in an upcoming term, am I required to enroll?

A: For info. on taking a break from UCSD (any reason), please see here.

Q: What happens if, due to low grades, I have to extend my time-to-degree?

A: You will need to submit a Completion Plan, which will be provided to you in the final term of what would be normative time based on your admit term (12 terms for freshman admits, 6 terms for transfer admits). Note that summer does not apply in your term count. If your college has not already provided you with the link to submit a Completion Plan, contact your college through VAC to request the link.

Q: Where can I learn about the campus repeat policy? Who is the point of contact for questions about the policy?

A: Click here to learn about the campus' repeat policy and contact your college with questions about this policy.

Q: How do I get approval to repeat a class if WebReg blocks me due to repeat policy limitation?

A: If you need to repeat a UCSD class for the third time, you must wait until the schedule of classes goes live for the term in which you hope to repeat the course, and then submit a request to your college to repeat the course. The colleges have sole discretion over approval of these sorts of requests. If your college denies your repeat request, alert PHYSICS through VAC so we can provide you with available options. If approval of the third repeat request is **not** granted, and the course is one

that cannot be completed outside of UCSD (eg. core LD PHYS or core UD PHYS course), you must change to a major outside the Physics Department, because it is **impossible to complete a UCSD Physics degree without taking all of these courses in residence at UCSD and earning a grade of C– or higher**.

Non-selective majors students often consider:

- **STEM:** Astronomy & Astrophysics, Mathematics, Cognitive Science, Economics
- **Non-STEM:** History, Political Science, Visual Arts

Q: Am I required to change my major if I receive a low grade?

A: A low grade does not *automatically* require you to change your major, but a change of major could be required if your college will not allow you to repeat coursework that is required for your current major (see previous question). In any case a low grade typically suggests that additional support or changes to your academic strategy may be necessary for success in the field. In many cases, a low grade suggests that you may need to revisit foundational concepts and improve in those areas before pursuing more advanced coursework. We offer a variety of degree options tailored to various student goals/needs and you are encouraged to consider which path best suits you:

- **BS Physics majors:** For students highly interested in pursuing graduate studies in Physics or who otherwise need knowledge, skills, and abilities (KSAs) at the level of our most advanced core PHYS topics (e.g., PHYS 105A required (105B strongly recommended), 130B required (130C strongly recommended), 140A required (140B strongly recommended). See Changing a Major Within Physics.
- **BA Physics majors:** For students not interested in physics graduate programs who need some knowledge, skills, and abilities (KSAs) at the level of our introductory core topics (eg. PHYS 130B is not required), and only a subset of core topics is included overall (e.g. BA degrees do not require PHYS 105A and/or PHYS 140A). These degrees are highly attractive for students planning to go out into industry as they include a high volume of "Self-select" courses, including a ton of courses and depts outside of Physics! See Changing a Major Within Physics.
- **Minor in Physics:** For students highly interested in select upper division courses in physics. See Changing to a Major Outside of Physics.

  A few Non-Selective Departments PHYS majors commonly change to:
  - If math is going well - something in MATH
  - If astrophysics is going well - something in the Astronomy and Astrophysics Dept.
  - If earth sciences is going well - something in SIO
  - If you like to explore how the mind works - something in the Cognitive Science Dept.

Q: How do I improve academically?

A: There are many changes that could help you improve academically. Please see How to Improve Academically on this important topic.

Is Physics the Right Fit for Me as a Major?

Everyone considering a physics major should see our Is Physics the Right Fit for Me as a Major slide.

When considering whether Physics is the best fit as a major, we recommend reflecting on your specific career interests. From there, you can work backward to reverse-engineer a pathway to becoming a competitive candidate for your desired career. Start by asking yourself:

- **Career**: What specific career or field are you interested in?
- **Degrees held by professionals**: What kind of degree(s) or academic backgrounds do professionals in this field typically have?
- **Knowledge, skills, and abilities (KSAs)**: What are the key knowledge areas, skills, and abilities required in this field?
- **Relevant courses**: Which UCSD courses align with those KSAs?
- **Best combination of majors/minors**: What combination of majors or minors will help you gain these skills and knowledge?

By following this process, you'll be able to make a more informed decision about the most effective academic pathway to reach your career goals. If seeking more advice on career exploration, see Careers for Physics Majors.

Students MUST follow either the standard academic plan or one of our alternate plans in order to complete a major/specialization in Physics. Students must take the entire PHYS 4 series for their particular major/specialization (we do not accept the PHYS 2 series lectures). Most major requirements are offered only once per year and are tied together by very strictly enforced prereqs. Therefore, students must enroll exactly as prescribed on our plans. If you are not yet in a PHYS major, read through the rest of this webpage and contact Physics Advising before declaring a PHYS major.

Where do UCSD Physics Majors End Up?

See Careers for Physics Majors for industry information. See "Where Have Physics Majors Gone?" for graduate school information.

For Physics majors with a Bachelor's degree, there are a variety of post-graduation opportunities, depending on your interests and goals. Here are some common paths:

1. Graduate School

- **Master's or PhD in Physics:** Pursue advanced studies in physics, which can lead to careers in academia, research institutions, or industry.

- **Related Fields:** Consider graduate programs in related fields like Engineering, Data Science, Computer Science, Mathematics, or Finance, depending on your interests.

- **Application Areas:** Some graduates go into applied physics, medical physics, or materials science.

2. Research

- **National Laboratories or Research Institutes:** Many organizations, such as CERN, NASA, or government-funded labs, hire physics graduates for research roles.

- **Private Sector Research:** Companies in the tech, engineering, and energy industries hire physicists for R&D roles.

3. Industry Jobs

- **Data Science/Analytics:** With strong problem-solving and quantitative skills, physics majors can transition into data science, machine learning, or artificial intelligence roles.

- **Engineering:** Physics graduates often work in fields like electrical, mechanical, or aerospace engineering. You may need to take additional certifications or training, but the transition is common.

- **Software Development:** With knowledge of programming (Python, C++, etc.), physics graduates can work as software engineers, particularly in simulation and computational modeling.

- **Finance/Quantitative Analysis:** Physics majors are sought after in quantitative finance, risk analysis, and algorithmic trading due to their strong math and statistical skills.

- **Consulting:** Companies hire physicists for their analytical and problem-solving skills, especially in management, strategy, or technology consulting.

4. Teaching

- **Secondary Education (High School Teaching):** Some physics graduates pursue teaching certifications to teach high school physics.

- **Teaching Assistantships:** You may also be able to work as a teaching assistant in undergraduate courses while pursuing further studies.

5. Internships or Fellowships

- **Industry Internships:** If you're unsure of your next steps, consider internships in industries like tech, finance, or engineering to gain experience.

- **Fellowships:** Many government agencies, research institutions, and private organizations offer fellowships that allow you to gain valuable work experience or continue research projects.

6. Entrepreneurship

- **Startups/Tech Companies:** If you're entrepreneurial, you can start your own tech company or work with startups, especially those in AI, robotics, or energy.

- **Consulting/Independent Work:** Some physics graduates go into consulting, offering their expertise in scientific problem-solving, modeling, and analytics to businesses.

7. Government and Defense

- **Government Agencies:** Physics graduates often work in governmental roles, including the Department of Energy, NASA, or other scientific research agencies.

- **Defense and Security:** Some find opportunities in defense contracting, where they may apply their skills in areas like systems analysis, cryptography, or weapons design.

8. Nonprofit Sector

- **Science Advocacy:** Work with nonprofit organizations that promote scientific education, climate change awareness, or innovation.

- **Policy Work:** Some physics graduates enter policy research or advisory roles in government or think tanks, particularly in science policy, technology, and education.

9. Medical and Healthcare Fields

- **Medical Physics:** With additional qualifications, some physics majors go into medical physics, working with imaging technology or radiation therapy.

- **Biomedical Engineering:** Apply physics to develop medical devices or technologies that improve patient care.

Conclusion:
The key to finding the right post-graduation opportunity as a physics major is identifying your interests and skill sets. Physics graduates are highly valued for their strong analytical, problem-solving, and quantitative skills, which can be applied in many different fields, from research and engineering to data science and finance.

Joint Majors

A joint major is an integrated program that combines two fields of study from two different departments into a single major. This means the curriculum is designed to blend both disciplines, often resulting in a more cohesive academic experience. Students pursuing a joint major usually have a set program of required courses that cover both areas, and they may not have the same flexibility as in a Double Major. Click here and do a webpage search for the word “joint’ to see which UCSD majors are joint majors. Note that there are no joint majors involving the Physics department.

Double Majors

A double major refers to a student completing two separate majors within their undergraduate degree, often requiring a specific number of credits and courses from each major. This typically allows for more flexibility in overall course selection during the undergraduate years, as the two majors are distinct and from different departments. See the campus policies on double majors and note that you must meet the campus’ eligibility requirements in order to propose a double major, and you must use the *PHYSICS* versions of forms found in our instructions available in a subsequent section of this handbook to draft your double major packet.

Double major requests must be approved by both major departments and your college. Make sure you are in good academic standing before submitting a double major request (eg. have at least a 2.0 gpa). The Physics Department does not prohibit the proposal of a double major between a major in our department and *any* other department on campus, no matter the name of the other department, major, and/or courses offered in the other department. To see what courses we accept from outside of the Department toward our majors, see the Major Requirements webpage.

Each department may have unique procedures for students doing double major planning and so you should check posted information on each department's website to ensure a smooth experience. **If your proposed double major is a selective major, you will need to apply and be admitted into that selective major before declaring a double major. DO NOT click "accept" on the offer to join the selective major once admitted. Instead, you MUST keep PHYSICS as your primary major and add the selective major via the Double Major Packet. Click here to learn more about applying to a selective major.**

Though the campus procedures suggest that you must meet with the Physics Department when planning for a double major including Physics, this *is not* absolutely required. It's important that you have an understanding of (1) our curriculum and the outcomes of our degree programs, (2) how to successfully schedule courses for each major (see subsequent subsections for more on this), and that you ensure you adhere to campus and department policies for processing your request to double major.

Eligibility to Add Physics as a Double Major

Admit Term	Admit Type	Eligible?
FA25 or Prior	Transfer	No (see here)
Any	Freshman	Yes (read subsequent sections)

What to do *Before* Deciding to Double Major

Many physics students consider the benefits of double majoring in a related field such as engineering, math, chemistry, or another science. Oftentimes, students are looking for the list of things they should do during their undergraduate years to get them to X destination and pursuing a double major is one thing at the top of their list. But neither preparing for a future in academia or industry is quite that simple or linear. There are typically multiple paths to a particular destination, and so your roadmap may not look exactly like someone else's. One thing is certain, you'll need to continually work towards developing the knowledge, skills, and abilities (KSAs) to make you a competitive applicant to graduate school and/or industry, and that will come from a combination of things, not just courses and grades.

In and of itself, the value of a second major comes down to how much the established curriculum will further develop your knowledge, skills, and abilities (KSAs) in your particular target career/research field and the exposure to opportunities you will gain by being a member of the second department/school (eg. major/school specific research/mentorship/internship/scholarship opportunities, advising, events, etc.). Physics students have double majored in obviously closely

related fields (eg. math, engineering, computer / data science, chemistry, biology, etc.) and ones seemingly less closely related (e.g. cognitive science, psychology, music, political science, etc.). Despite what one may think, there is not any one "common" combo of double majors including physics and we do not maintain statistics on common double majors as they do not carry actual value. If you are unsure of what other majors to look into, there's no getting around taking the time to look at other departments and programs to see what they have to offer.

Just as you rely on the information provided by the Physics Department to learn about our programs, it's important to explore other departments and their fields as well. Start by reviewing their websites and available resources. As you explore, take note of any questions you may have and consult their advising guidelines to find the best way(s) to get those questions answered.

One common misconception is that having a double major on one's transcript/degree will automatically make a student look more attractive to companies and/or graduate programs. Our faculty would like physics majors to know that it is *far better* to be *stellar* in one major than *average* in two. Another misconception is that only students in a particular department/school can participate in things offered by that department/school. Be thorough as you look into opportunities - many are open to students across departments/disciplines/schools. When in doubt, ask if you are eligible!

> *More advice for those planning to go into industry after undergrad:* If you're planning to pursue a career in a technical field directly after graduation, then the major(s) you select should help develop core competencies for your target career field and provide opportunities to engage material in a way that will translate to industry (eg. majors that require/allow many hands-on labs and/or project-based courses will help you gain tangible skills you can readily apply in industry). Of course, research work and internships should always supplement coursework to become a competitive applicant in your target career field (this becomes all the more important if your curriculum does not allow you to develop much hands-on experience). *Keep in mind that the physics curriculum here at UCSD is primarily theoretical, so supplementing with research is essential if planning to go on to a technical field.*
>
> *More advice for those planning to go to graduate school:* If you're planning to further your education, then your grades in your undergraduate coursework and the relationships you build with professors in the classroom and during your undergraduate research experiences will be crucial. After all, by senior year you will need to have at least *three* professors who are willing to write *strong* letters of recommendation to accompany your graduate school applications.

If you are not sure why you're planning a double major, we would strongly encourage you to complete the Five Steps Physics Majors Should Take Early on in their Undergraduate Career and learn about Careers for Physics Majors. Before considering a double major, you really should have a sense of what you're interested in and where you hope to go, and the advice in these sections will help you on the path to determining these things.

Administrative Planning for a Double Major

Declaring a double major early in the undergraduate years ensures the most time to complete the requirements and take advantage of opportunities in both departments. Before deciding to move forward with filling out a double major packet, please check to make sure your proposed double major is feasible (see instructions below). Keep in mind that most PHYS courses are offered only once per year and must be completed in the order listed on the plans we post and provide (reference the standard academic plan and alternate plans from which PHYS majors are required to select and follow for completing PHYS major).

> **If you are already a double major and you want to change an upper division class you're using for only *one* of your two majors**, contact the Department that owns the major through the VAC (you **do not** need to submit a revised double major packet to change upper division classes that are applying to only one of your two majors).
>
> **If you are already a double major and you want to change an upper division class you're using for both majors**, you must submit a revised double major packet.

Time-to-Degree for Double Majors

Students seeking to double major, especially in two STEM fields, frequently develop plans that extend ~1 year *beyond* their standard time limit and, so far, the campus has been supportive of these requests.

For students admitted to UC San Diego FA19 or later, UCSD no longer has a *unit* limit but, instead, has a limit on the number of *quarters* an admitted student can enroll at UCSD without needing an extension request approved (see Quarter Limit Policy):

- Freshman can enroll for 12 quarters (4 years) before needing an extension request approved (summer terms do not count toward the limit).
- Transfer students can enroll for 6 quarters (2 years) before needing an extension request approved (summer terms do not count toward the limit).

As a student nears their quarter limit, the college will begin notifying the student through the VAC and they will provide step-by-step guidance on when and how to develop and submit the required Completion Plan in the Degree Planner system which is accessible and strictly used for the extension request process. If a student is approved to double major, the student should feel confident they will be permitted to enroll in the terms listed on their double major packet. Please note that, in these cases, a Completion Plan is typically still required in order to remove the quarter-limit hold that gets automatically placed on the student's record by the campus system when they enroll in their first term

at UCSD (the hold is typically **not** adjusted when the student is approved for their proposed double major).

Though there is no cost to declare a double major, students who are using summer to complete requirements for their major(s), minor(s), GE(s), and/or university requirements should be aware of the costs of Summer Session. Students should consider the cost of enrolling in any regular term beyond their quarter limit. Students receiving financial aid and/or scholarships should consult with the financial aid office to learn more about options/limitations related to extensions to normative time-to-degree. Students who are funding their own education should consider the cost of continued enrollment beyond normative time-to-degree.

Is my proposed double major feasible?

To see the feasibility of completing one of our majors on top of another major from an *academic* standpoint, and to schedule courses for your proposed double major, complete the following steps:

REMEMBER

Every physics major MUST follow one of our posted/provided plans.

1. Pull up and print out the standard academic plan for your proposed PHYS major or the alternate plan you will be following. *The physics plan will be your main plan because most of our courses are offered only once per year, in a specific term that does not typically change from year-to-year, and are listed in the appropriate place based on the listed prereqs which, as per our posted policies, will always be strictly enforced. (If you are working off of a personalized plan provided to you by the Physics Advisor through VAC, you will complete steps 2, 5 and 6, only.)*
2. Pull up and print out the standard academic plan for your second major (hereafter titled MAJ2).
3. On both plans, cross off any major and GE courses you already have credit for based on coursework from outside of UCSD (eg. AP/IB/A-Level course exemptions, transfer courses).
4. On your PHYS plan, move any LD math requirements around, as permissible based on the prereqs for each major: (if you've already finished all of your LD math, just remove them from both plans and proceed to step 6).
    - For *PHYS*, MATH 18 must be completed no later than the end of summer in year 1.
    - For *PHYS*, MATH 20A must be completed no later than the end of fall in year 1.
    - For *PHYS*, MATH 20B must be completed no later than the end of winter in year 1.
    - For *PHYS*, MATH 20C must be completed no later than the end of summer in year 1.
    - For *PHYS*, MATH 20E must be completed no later than the end of fall in year 2 (freshman); fall in year 1 (transfers).
    - For *PHYS*, MATH 20D must be completed no later than the end of winter in year 2.

5. On the plan for MAJ2, cross off any LD math requirements that are already on your PHYS plan.
6. Finally, move ALL of the remaining MAJ2 requirements from the MAJ2 plan to the PHYS plan.
7. Tally your new total units per term and year.
8. Review the plan to see if you think you could handle the workload. Also send the plan to both major departments and ask them to review the plan for feasibility and completeness (click here to submit the plan to Physics).

Additional Double Major info. Specific to Non-Majors

If you are not currently a physics major and want to add Physics as your double major, see our Administrative Planning for a Double Major info., above, **and** our Instructions for Filling Out & Submitting the Double Major Packet, below.

Additional Double Major info. Specific to Current Physics Majors

If you are currently a physics major and want to add a major from another department as your second major, you should contact your proposed other major department using the advising options posted to their website to discuss your interest and make sure it's an appropriate fit based on your future goals and the Knowledge, Skills, and Abilities (KSAs) you will glean. There is no "perfect" double major to go along with physics, it really all depends on what you want to do after you graduate. When you're ready to begin drafting your Double Major Packet (DMP), please follow the instructions below. If your proposed double major is a Selective Major, you must follow the procedures of the particular Selective major in order to be admitted. **If your proposed double major is a selective major, you will need to apply and be admitted into that selective major before declaring a double major. DO NOT click "accept" on the offer to join the selective major once admitted. Instead, you MUST keep PHYSICS as your primary major and add the selective major via the Double Major Packet. Click here to learn more about applying to a selective major.**

Instructions for Filling Out & Submitting the Double Major Packet

Double major packets can only be submitted **after** the campus has released the new tool for major/minor declarations. Prepare your packet based on our instructions and hold onto it until the campus announces the new system!

You **must** download and use our version of the double major documents and must complete their double major packet exactly as listed in the instructions, below. You can fill out the forms using Adobe, even without an Adobe account.

Make sure you:

- Write neatly, in pen, or use a computer to mark your documents.
- Keep all documents as clean as possible. Avoid scribbles, skipped lines, dark eraser markings, crumpled/folded pages, etc.
- Do not change the formatting of the forms (e.g. deleting/adding fields, adding colors, highlights, etc)
- Fill in *all* required information - do not leave sections of the documents blank.
- Remember, you MUST follow either the standard academic plan or one of our alternate plans in order to complete a major/specialization in Physics.
- Go through this entire section *even if* you've already drafted your packet to ensure your packet has been properly put together and is submitted to the correct location.

How to Fill Out the Double Major Form

It is important to follow the instructions below so you will properly fill out your forms for Dept. review. Please note that incomplete and/or improperly completed forms will need to be returned for edits.

Step 1: Download the appropriate *Physics version* of the Double Major Form for your intended type of degree:

B.S. Physics majors

B.A. Physics

Step 2: Adjust the *Physics* side of the form to reflect the requirements for your particular major/specialization, as detailed below.

Note:

- Blank slots should be filled in with the eligible courses you've self-selected.
- The **BA** requires a total of 12 upper division courses - up to 2 can be shared with your other major.
- The **BS** requires a total of 14 upper division courses - up to 4 can be shared with your other major.
- If you plan to take more courses than the major requires, DO NOT list the extra

PHYS BS				PHYS BA		
	Course	**Area**			**Course**	**Area**
1	PHYS 100A	Core		**1**	PHYS 100A	Core
2	PHYS 100B	Core		**2**	PHYS 100B	Core
3	PHYS 105A	Core		**3**	PHYS 110A	Core
4	PHYS 110A	Core		**4**	PHYS 120	Core

5	PHYS 120	Core		**5**	PHYS 130A	Core
6	PHYS 130A	Core		**6**	PHYS ____	PHYS UD RE 1
7	PHYS 130B	Core		**7**	PHYS ____	PHYS UD RE 2
8	PHYS 140A	Core		**8**	PHYS ____	PHYS UD RE 3
9	_____	PHYS UD LAB		**9**	_____	PHYS UD RE 4
10	PHYS ____	PHYS UD RE 1		**10**	_____	PHYS UD RE 5
11	PHYS ____	PHYS UD RE 2		**11**	_____	PHYS UD RE 6
12	PHYS ____	PHYS UD RE 3		**12**	_____	PHYS UD RE 7
13	_____	PHYS UD RE 4				
14	_____	PHYS UD RE 5				

BS PHYS majors require 12 upper division courses. Between the “shared” and “PHYS ONLY” side of your form, combined, only 12 courses can be listed.

Step 4: Fill out the “Overlapping” section of the form as listed for any UPPER DIVISION courses you hope to apply to both majors. Do not include any LOWER DIVISION courses in the “Overlapping” section of the form.

Step 5: Work with your other department to correctly fill out the side for your other major.

Step 6: Sign and date form.

How to Fill Out the Statement of Purpose

Step 1: Proceed to Pg 2 of the Double Major Form document

Step 2: Type 100-300 words and address why you want to double major, and why you've selected the specific majors you have chosen. In your statement, please discuss how these specific majors address your interests and career goals.

Step 3: Save the three page packet in PDF format.

How to Fill Out the Quarter by Quarter Plan

Remember, you MUST follow either the standard academic plan or one of our alternate plans in order to complete a major/specialization in Physics.

Make sure you spell out each specific *lower division* major requirement on your plan (do not use only requirement labels, such as “Programming”).

Make sure you spell out each specific *upper-division* major course on your plan (do not use only requirement labels, such as "PHYS UD Lab").

Step 1: Open the campus' Quarter By Quarter Form (also known as the Academic Planning Worksheet).

Step 2: Add your name, the name of each of your majors and any minor(s); be sure to include the major and minor codes.

Step 3: Fill in the last two digits of the academic year for each term (your qtr-by-qtr form will need to include all past, current, and future coursework). For example, for Fall 2024, Fall 20__ would have "24" added in place of the underline so that it reads Fall 2020. Keep in mind that academic years work as follows:

Fall 20**24**	Winter 20**25**	Spring 20**25**	Summer 20**25**
Fall 20**25**	Winter 20**26**	Spring 20**26**	Summer 20**26**
Fall 20**26**	Winter 20**27**	Spring 20**27**	Summer 20**27**
Fall 20**27**	Winter 20**28**	Spring 20**28**	Summer 20**28**
Fall 20**28**	Winter 20**29**	Spring 20**29**	Summer 20**29**
Fall 20**29**	Winter 20**30**	Spring 20**30**	Summer 20**30**

Step 4: Starting at the top of the quarterly grid, list your past, current, and future UCSD coursework, including requirements for your majors, minor(s), GEs, and university requirements (see next section for how to properly schedule your major requirements). Be sure to also include any/all courses you plan to take for personal interest (i.e. courses that aren't applying to any degree requirements).

- Remember, you MUST follow either the standard academic plan or one of our alternate plans in order to complete a major/specialization in Physics.
- For assistance with scheduling the physics major requirements, see How to Properly Schedule the Physics Major Requirements on Your Qtr-by-Qtr Plan, below.
- For assistance with scheduling the requirements for your other major, consult with the dept. owning that major.
- For assistance with scheduling GE and/or university requirements, consult with your college and with the department offering each particular course.

How to Properly Schedule the Physics Major Requirements on the Qtr-by-Qtr Plan

All of the *physics* courses that are physics major requirements that have course numbers explicitly listed on the standard academic plan (or the alternate plan) you are following **must** be in the same

terms on *your* qtr-by-qtr plan for the double major packet; none of these courses can be moved to other places on your plan.

Programming, LD Breadth (biophysics, materials, earth science specializations, only) the PHYS UD LAB, DEPTH, and/or RE courses may move or be shuffled based on what specific course you choose (or must take), the prereqs, and the schedule of offerings. Per the How to Plan Your Schedule guidance, there are three things you must know in order to accurately schedule each of these courses:

1. Which courses can I choose? See the Major Checklists
2. What are the course descriptions and prereqs? See the *Courses* section(s) of the Catalog
3. When are the courses offered? See dept. schedules of course offerings:

   BIO, CENG/NANO, CHEM, CSE, ECE, MAE, MATH, PHYS, SIO

Note: If you are taking courses that are in excess of the major requirements, include them on your plan (**do not** list them on your double major form).

Step 5: Tally all of the units/terms as directed on the plan.

- Keep in mind that PHYS 120 is a 5-unit course.
- Keep in mind that PHYS 2CL and 2DL are each 2-unit courses.

Step 6: Compare your plan to the Major Checklists to ensure that all physics major requirements taken at UCSD (including past, present, and future courses) are on your plan.

Step 7: Sign and date the plan.

Step 8: Make sure the plan is in Portrait format (not landscape) and all cells are appropriately right or left justified (eg. cells that include units will all be right-justified so the units appear in a readable and easily tallyable format) and then save a PDF copy of the document.

Submitting and Routing Your Complete Double Major Packet

Step 1: Combine your documents into a single PDF packet.

Step 2: Double major packets can only be submitted **after** the campus has released the new tool for major/minor declarations. Prepare your packet based on our instructions and hold onto it until the campus announces the new system!

Minors

Everyone interested in a minor at UCSD should read the campus policies and procedures for declaring a minor. Current physics majors can plan for a minor outside of Physics while non-majors can plan for a minor in Physics.

Plan for a Minor Outside of Physics

Physics majors are invited to consider one or more minors outside of the Physics Department. Click here to see all minors offered at UCSD, noting that you can choose any minor(s) except the “Physics” minor owned and operated by the Physics Department, numbered PY29 in the **TSS Campus Tool** (not yet available). Please note that not every department/program/field has a minor (e.g., there is no minor titled “nanoengineering”).

Minors typically include a minimum of 28 units of coursework, with 20 of these units usually being upper-division courses. Having a minor on your record typically won't make you more competitive for grad school, industry, or research. Instead, the actual content of the courses that are part of your major(s) and minor(s), along with stellar grades, will make you stand out.

The field in which you should minor depends on your specific future goals and how well the coursework for the minor aligns with those goals. The best way to determine a good minor (or major) is by looking at job ads for positions you might be interested in and reviewing the application qualifications and expected experience. Then, look for UCSD courses and programs that include what you need.

Each minor provides a unique set of Knowledge, Skills, and Abilities (KSAs). You may want to pursue a minor if the KSAs you will gain enhance your academic or technical potential. To find out what KSAs a particular minor offers, look at the minor department’s posted information and then consult with them ask any follow-up questions you have. *You will also work directly with the department that owns the minor for help with adding the minor requirements to your graduation plan (you will not be working with the Physics Advising Team on planning for your minor).* The schedule planning resources will help you and your proposed minor dept. to know where there is space in your schedule to add minor courses.

Work with your proposed minor department on planning your minor and adding your minor courses to the academic plan you are following in physics. Once you have added the minor courses to your academic plan, review the total number and type of units you will be expected to take each term. Major requirements cannot be waived or substituted to make room for a minor. If the load is too heavy, you may reconsider declaring the minor.

Send the graduation plan to both your major and proposed minor departments so they can check it for feasibility and completeness (click here to submit the plan to Physics). If you want to proceed with declaring a first and/or second minor, use the **TSS Campus Tool** (not yet available) on TritonLink to submit your minor proposal for department (and sometimes campus) review.

Remember, there is no limit to the number of lower-division courses that can be shared between your Physics major and your minor. However, a maximum of two upper-division courses (8.0 units) may be

shared between a major and minor. Click here to request permission to substitute a listed Physics major course with a course from your minor (approval is not guaranteed).

See and follow the campus policies and procedures for declaring a minor.

Common Minors for Physics Majors

Common minors physics majors pursue are mathematics, engineering mechanics, engineering physics, computer engineering, data science, and music. To look into these minors, start by viewing posted information and seeking advice. To look into minors in other depts/fields, google the name and topic to find the relevant info. (eg. “UCSD psychology minor”, “UCSD psychology schedule of offerings” “UCSD psychology advising”).

Minor	Minor Requirements	Schedule of Offerings	Advising Options
Computer Engineering	See here	See here and here	See here
Data Science	See here	See here	See here
Electrical Engineering	See here	See here	See here
Engineering Mechanics	See here	See here	See here
Engineering Physics	See here	See here	See here
Mathematics	See here	See here	See here
Music	See here	See here	See here

Plan for a Minor in Physics

We offer only one minor in our department and the title of the minor is *Physics*. Non-majors are invited to consider a minor in Physics (physics majors cannot also earn a minor in physics).

See the campus policies and procedures for declaring a minor.

Everyone considering a minor must carefully read and adhere to the Minor information on our Department website (frequently asked questions are addressed in that information).

Study Abroad

Finding a Program & Planning to Apply to Study Abroad

Click here to learn about study abroad options at UCSD and to learn the steps to plan and apply to study abroad. After that, go to this link to see programs UCSD recommends for physics majors. Please work with the Study Abroad office to explore programs and courses you can take, and to get help with filling out all required study abroad application documents. You will also direct all questions about specific study abroad programs to the Study Abroad staff (some of the Study Abroad staff actually get to visit some of the study abroad locations, so they can share a lot about them)! Also ask the Study Abroad staff if they can help you to connect with a student who has previously studied abroad at the location you're interested in so that you can hear a student's perspective about a particular program/location. Click here to see where physics majors have gone in the past, and what they took and received equivalency for at the time they went abroad. Keep in mind that availability of study abroad programs & courses may change from time-to-time and that there are no pre-approved equivalencies for upcoming terms (see *Course Equivalency for Study Abroad Courses* for more information on this topic).

Doing Research while Abroad

If you plan to do research abroad, you will need to contact the faculty at the school where you hope to do research to see what opportunities they have available and the steps to get involved (similar to the process here at UCSD). Some EAP locations may even have research opportunities specifically tied to the study abroad experience! If you do physics research for which you end up earning units that appear on your UCSD record, then you could potentially request that 4 of those units apply in place of the 4-unit PHYS 199 we typically accept as a PHYS UD RE for any physics major/specialization.

Qtr-by-Qtr Planning for the Time You'll Be Abroad

Physics is universal, so it's likely that you'll find physics courses offered at any study abroad program you look into. The real challenge comes with finding a study abroad program that orders the courses in the same way as we do here at UCSD (this is pretty uncommon due to UCSD being a quarter system and most programs abroad being on the semester system). Since the physics major program requires you to take particular courses in particular terms for the duration of your time at UCSD degree as per the academic plans, there's no "perfect" time to study abroad, as any term abroad might disrupt the timing of your major requirements. To stay on track, you would need to seek out a study abroad program that offers exactly what you'd be taking for your major if you were at UCSD:

> Example: A sophomore PY29 major who is hoping to go abroad for the entire academic year would be looking for a program that offers the equivalent of UCSDs PHYS 4C-D-E, MATH 20D-E, and PHYS 2CL, which are the required major-related courses taken in YEAR 2 as per

the academic plans in order to be eligible for the YEAR 3 courses (PHYS 100A-B, 105A, 110A, 120, 130A).

We believe students should determine the place they want to study abroad based on whatever they are hoping to get out of their EAP experience. Students can attempt to complete major requirements while studying abroad, or can study abroad and complete non-major related courses. Progress in the physics major and/or time-to-degree **may** be interrupted if you choose to study abroad. If studying abroad is important to you, plan for the possibility that you may need to request an extension of your time-to-degree if your trip causes you to deviate from the plan for graduation UCSD has provided to you.

Course Equivalency for Study Abroad Courses

There are no pre-approved equivalencies with study abroad courses for physics courses. But, as stated in the main section above, you can click here to see where physics majors have gone in the past, and what they took and received equivalency for at the time they went abroad. Keep in mind that availability of study abroad programs & courses may change from time-to-time and that there are no pre approved equivalencies for upcoming terms. Please work with the Study Abroad office to explore programs and courses you can take during your time abroad. Once you find a program that offers courses you think might be equivalent to UCSD courses, contact the school offering the program and request a recent course syllabus. Once you obtain the syllabus, petition the respective department here at UCSD (for physics courses, click here and submit a physics course equivalency request; we'll be happy to pre-review the course and tell you if we think it might be equivalent to one of our courses). Please Note: Per campus policy, formal petition of EAP physics coursework can only take place once you've officially completed the EAP experience and you are responsible for saving all of your course material from your time abroad, in case we need to review it to make a determination about course equivalency. Petitions for course equivalency are reviewed and approved on a case-by-case and term-by-term basis. You are *not* guaranteed an equivalency for an EAP course simply because the course was previously taken and approved. You are not guaranteed admission into EAP courses you listed on your EAP planning form, even if the courses are required in order for you to remain on track in your major here at UCSD.

If studying abroad is important to you, plan for the possibility that you may need to request an extension of your time-to-degree if your trip causes you to deviate from the plan for graduation UCSD has provided to you.

Completing & Submitting the EAP Planning Form

To have an EAP Planning form processed by the Physics Department, please submit it here.

The Physics Honors Program (PHYS 199H)

Click here to learn all about the Physics Honors program.

Applying to the Honors Program

Once you have completed the eligibility requirements, you can apply to the Physics Department Honors Program. Applications must be developed and submitted using the instructions below. Applications are due no later than Friday of week 1 in the term you want to start the program (for each summer session, requests are due no later than Friday the week before the start of the session). Late applications will not be accepted. Approval of the TEA application signifies acceptance into the program.

How to Fill out the Description of Honors Thesis Research Project and Bibliography

Step 1: Work with your Faculty Honors Thesis Advisor to develop a 1-2 page abstract about your project.

Step 2: Work with your Faculty Honors Thesis Advisor to develop a 1 page bibliography.

Step 3: Combine your 2-3 page document into a single PDF file.

How to Obtain a Copy of Your Most Recent Degree Audit

Step 1: Click here to be taken to the Degree Audit system

Step 2: Run your audit

Step 3: Download a PDF copy of your audit.

Submitting Your Complete Honors Program Application

Follow the Department's Special Studies Enrollment Instructions.

Research & Related Internships

Undergraduates in physics are involved in laboratories at levels that range from assisting a graduate student or postdoctoral fellow with their respective project to running their own research project. In both cases the work *may* even lead to a publication in a scientific journal. Typically, assistance involves data analysis, programming laboratory equipment, and help with sample preparation and data collection and is the route followed for stays of one year or less in a laboratory. Independent projects, which often occur during the second of a two year stay in a laboratory, involve both

independent work that is relevant to the mission of the laboratory or trying out "a crazy idea" that just may work.

There is no specific time to begin research during the undergraduate years, some students even begin during their freshman year. Undergraduate research typically begins when an opportunity presents itself in a field a student is interested in, the student has adequate preparation for the opportunity (sometimes no experience is necessary and the student is trained during the project), and the student takes the initiative to secure that opportunity with the faculty member supervising the research. You'll know if you're ready for research once you consult with the proposed faculty member about the proposed research field, project, your prior research knowledge and experience, as well as your current academic status and standing, etc.

Research can be completely voluntary (hourly work for no units, no pay), paid (hourly work for pay (or salary)), or for units (3 hours of work per week per unit). Check your plan for graduation to see terms in which you might have some hours available to conduct research. Terms in which you're short on units might be especially attractive (but note that research often ends up being stacked on top of a full load of classes). If using research units (i.e. a 4-unit PHYS 199 or 199H) toward a PHYS UD RE for your physics major, keep in mind that this requirement can be completed in any term in which you secure an opportunity. If pursuing an opportunity that is tied to specific terms (eg. TRELS, Faculty Mentorship Program) your research will need to be in the terms those programs offer it. Faculty may also have particular opportunities available in particular terms, so you'll want to coordinate terms for research based on when faculty would be able to have you join their lab/group. Many students try to wrap up GEs and university requirements early on to make space for research in your schedule (consider taking these courses in summer, if attending summer session can work for you. Research opportunities help you to gain experience and mentorship from peers and professors, and can help build relationships with those who can later provide you with support when applying to internships, jobs, and graduate/professional programs. Most students seek letters of recommendation from faculty they've worked with on research projects, so getting involved in research early on can help you have a lot of time to develop meaningful relationships. In Physics, students are responsible for seeking out and securing their own research opportunities. Ahead of seeking out opportunities, it is strongly advised that students learn about research fields and research skills (see all following sections).

Learning About Research Fields

Learning about various research areas in physics often begins by attending department seminars and by looking at advertised opportunities (see Seeking Out & Securing a Research/Internship [or related funding] Opportunity). Learning about the research currently being conducted by faculty at UCSD is often found by reviewing the faculty member's information and associate links in the Dept. Faculty Directory by Research Area and Google Scholar. Undergraduates are also invited to enroll in the *Faculty Research Showcase for Undergrads* (PHYS 191). Also check the Physics Calendar of Events & Opportunities for events hosted by the dept. and/or associated clubs/groups.

Research Skills

One of the most basic skills you can arm yourself with ahead of seeking a research opportunity is programming. Under our current curriculum, an introductory course teaching a programming language is required for all physics majors. There is no perfect programming language to learn first, but students tend to find that learning Python is relatively easy; Python also happens to be the most popular programming language currently being used in STEM. UCSD offers many courses that can help students to learn and practice programming; the major checklists show the courses that we accept towards the lower division programming requirement for physics majors. UCSD Extension also offers courses and certificates in programming that may be of interest, though programming courses taken through UCSD Extension do not apply to the major. UCSanDiegoX may also have free online courses that can help you develop your programming skills.

> Note from Comp-Phys faculty: Programming languages with relatively transparent syntax, such as MATLAB and Python, is a good starting point to prepare for computational projects. Mastering mathematical methods, such as eigenfunction expansions, complex analysis, asymptotic approximation methods, Fourier methods.

Each research opportunity may draw upon unique Knowledge, Skills, and Abilities (KSAs), and so it is important that you carefully review the posted info. on qualifications for the lab/group you are interested in, and consult with the individual/group you hope to work with to find out if there are additional steps you can take to prepare. Some labs take students with little to no experience (eg. some astro. Labs & groups), while others have some KSAs that are essential to have starting out (eg. Barreiro lab, see here).

Engaging with Researchers About a Potential Opportunity

You'll know you're ready to begin consulting with a researcher (and/or graduate student) about an opportunity **after** you've taken the time to learn about it via their posted information. See Seeking Out & Securing a Research/Internship [or related funding] Opportunity.

It's also important to think about what research would most interest you and what you're hoping to get out of the experience.

You may begin engaging researchers once you've developed a ton of knowledge, skills, and abilities (KSAs), or because you have absolutely none, or even somewhere in between.

In most cases, you'll need to speak with the researcher in person to discuss an opportunity in depth, but first you need to get a meeting arranged. For this, you'll typically use an email to inquire about a day/time to meet them and/or their group.

Once you have the ear of the researcher, use your time wisely. Be ready to say what you've learned from their posted info. and come prepared with questions about information not available online.

Think about the Five Ws (and the H)

- **Who** is in your lab/group? (Ph.D. holders only? Grads? Undergrads?)
- **What** more do you want to know about their research that isn't in publicly posted information? What are the real-world applications of the research they are conducting?
- **Where** is the research conducted (lab, field, office)?
- **When** do your projects typically run? When should I reach out to get involved?
- **Why** is this research being done?
- **How** would you sum up your research in a few sentences to a 5th grader? How can I best prepare to contribute in this field or to your lab?

Frequently Asked Questions (FAQs) About Contacting Faculty about Research

Q: What if I reach out to a researcher and they do not reply?
A: If a researcher does not reply within 5-7 business days, there could be many reasons. For example, the researcher…

…is away from email (e.g. sabbatical, travel, etc.)
…saw the email but forgot to reply
…is not taking on students and this is their way of communicating this
…has posted a different method for applying to their lab/group (eg. per the Joining a Physics Faculty
Lab/Group sheet) and you are expected to adhere to that information
…has posted the info. your email stated you were seeking, so the researcher sees no need to reply
…is slow at email and will eventually reply
…some other reason for not replying.

Q: When should I send a follow-up email to a researcher who I wrote but didn't hear back from?
A: Provided you've done your due diligence (see above), it would be safe to send a follow-up email after 5-7 business days (be sure to exclude weekends, campus holidays, and other campus closures/breaks). Persistence can and often does pay off!

Q: What if I am too shy to reach out to a researcher. How can I secure an opportunity?
A: If you are feeling shy, it may help to speak with a researcher in the company of one/more peers who share your passions. However, keep in mind that if there are limited positions available, a peer could end up being your competition. (Eek!) Another avenue would be to attend seminars and colloquia where you can typically meet researchers in an informal and more relaxed environment (see upcoming seminar days, times, locations here). You can also often engage faculty at department-related events (e.g. those hosted by the Department, Student Success Center, and/or SPS Club).

Q: What if I have no experience at all?
A: UG research is often the place to get first-time experience! Researchers were once in your shoes, seeking an opportunity to get research experience, so they have very realistic expectations of undergrads who approach them. There will definitely be some opportunities unavailable to those with no experience, as some

work requires some prior knowledge, skills, and abilities (KSAs), but even those opportunities are good to engage researchers on so you can learn what KSAs to pursue to prepare for future opportunities.

Q: Is GPA important when applying to research labs/groups?
A: It depends. Some researchers review academic records closely; others don't. If your GPA is low, consider whether now is the right time to take on research, especially if it could impact your academic performance. Be honest about your academics; researchers often assume strong performance and may offer mentorship even if research isn't the best fit just yet.

Q: Can I receive compensation (e.g., monetary, course credit, letters of recommendation)?
A: It depends. Consult with your researcher to learn more about the potential for compensation for your work.

Q: What should I write in an email to a researcher I want to approach about research?
A: Some researchers ask/require for you to email them with particular information and/or materials, while others do not. We cannot script an email for you, as researchers would quickly catch on to the fact that students are using a template. Consider the following:

- Email from your @ucsd email address
- Include your name and a bit about yourself
- Note what in their research piqued your interest
- Mention relevant knowledge, skills, and abilities (KSAs) you have to offer (e.g., coding, technical writing, etc.) or at least state you'd like to meet with them to discuss what you feel you have to offer
- Be professional and concise
- Consider offering a Coffee/Dinner w/ a Professor opportunity (you get one per quarter)

Seeking Out & Securing a Research/Internship [or related funding] Opportunity

There are many locations where you can search for research/internship [or related funding opportunities] and it is your responsibility to stay on top of seeking out and applying to opportunities by the posted deadlines. Be sure to note the point of contact for each particular opportunity and use the listed point of contact to learn more about the opportunity and to pose any questions/concerns you have about applying/participating. Please keep in mind that, at this time in Physics, the physics faculty require students to work with them and their groups, directly, to discuss the possibility of arranging a research opportunity (click here to see contact information for every Physics faculty member. Any/all opportunities provided to the Dept. by the faculty are sent out to the mailman lists and/or posted at the links below.

Most opportunities require applications to be submitted several months in advance. Most opportunities repeat, annually, so if you miss an award for a particular period of one year, you can plan to apply in a subsequent year.

Summer Opportunities off Campus - REUs

Click here to see summer physics Research Experiences for Undergraduates (REUs). Also explore the site more broadly for other STEM opportunities. Use the "Advanced Search" feature to filter!

Note: Summer program dates vary. If a program you're interested in begins before the spring term ends at UCSD, contact the program to see the options available based on their program restrictions.

Letters of Recommendation for Opportunities You Apply for

If you need letters of recommendation for any opportunities you're applying for, we recommend you follow the advice in the Letters of Recommendation section of the handbook.

Summer Opportunities on Campus

- School of Physical Sciences Summer Program for Undergraduate Research in Science (SPURS).
- Undergraduate Research Scholarship for the summer.
- Undergraduate Summer Research Program.
- UCSD CCoM **REU**
- UCSD JSOE **REU**
- UCSD RIMSE **REU**

Other Opportunities on Campus (Various times of Year)

- Joining a Physics Faculty Lab or Group (This sheet shows what Physics Dept. faculty have reported about how to join their lab/group directly (not via a campus program))
- Dept. Faculty Directory by Research Area (once you select a faculty member's name, proceed to their webpage to learn more about their projects/group).
- Physics Honors Program (for physics majors in their senior year, only)
- School of Physical Sciences Transfer Research Experience (T-REx)
- Faculty Mentor Program site (you can under any PHYS faculty member who agrees to supervise you)
- Undergraduate Research Hub

- Spreadsheet where you can sort/filter through opportunities (this will show you programs the campus has that can help students at various points in their academic journey to get involved in research)

- Undergraduate Research Scholarships (including summer)

- Academic Enrichment Programs (AEP) (you can work under any PHYS faculty member who agrees to supervise you)

- Academic Internship Programs (AIP) (you can under any PHYS faculty member who agrees to supervise you)

- PATHs Scholars

- UCSD STARS

- Team Internship Program (physics majors have been invited to participate even though they are not part of JSOE)

The following sites will begin again being updated once the new Undergraduate Advisor has been trained:

- Opportunities Folder in the Tools for Physics Majors Google Drive
- Opportunities Spreadsheet (to see a list of every item from the Opportunities folder in a way you can sort by activity type, due date, week posted, etc.)
- Faculty Seeking Undergrad Researchers Spreadsheet (This sheet shows any specific opportunities physics faculty have told the dept. about)

98s, 99s, 198s, 199s, 199Hs (aka *Special Studies* Courses)

Be sure to also read the subsections and note deadlines in red.

Special Studies courses allow students to earn units for special readings, research, and related writing and presentations. You will sign up for Special Studies courses term by term only ***after*** you and a faculty member have discussed all of the details about the project (see section above for how to seek out an opportunity if you don't already have a project in mind). You can work under any faculty member at UCSD and the prereqs all depend on the actual project and what your faculty member thinks you need in order to successfully perform the work. Special Studies 98, 99, 198, 199, and 199H courses are not included in the campus' 25% limit of P/NP coursework. When checking to make sure that no more than 25% of your UCSD courses were taken for P/NP credit, do not include any of your 98s, 99s, 199s, or 199Hs.

Additional Course-Specific Policies for Special Studies

98s, 99s

- You must have completed between 30 and 90 units and you must have a cumulative GPA of at least 3.0.
- Are available for 2 units, only, and you must commit to at least 6 hours of work per week.
- To sign up under a non-PHYS faculty member, see Taking a Special Studies Class Outside of Physics.

199s

- You must have completed more than 90 units and you must have a cumulative GPA of at least 2.5. (You can request a 199 if you have less than 90 units, but approval is not guaranteed.)
- Are available for 2, 3, or 4 units and you must commit to at least 6, 9, or 12 hours of work per week, respectively.
- PHYS 199 can be taken up to three times and for a maximum of 12 units, overall.
- A single 4-unit PHYS 199 can be applied as a restricted elective for your physics major, as long as a PHYS 199H is not also applying.
- To sign up under a non-PHYS faculty member, see Taking a Special Studies Class Outside of Physics.

199Hs

- Are only open to students who have applied and been accepted to the Physics Honors Thesis Program.
- Must be under a PHYS faculty member.
- Requires prior completion of all required lower-division physics courses, nine upper-division physics courses, and a GPA of at least 3.50 in the physics major.
- Include 8-12 units of PHYS 199H enrollment (2-3 terms @ 4-units each / 1 term @ 4 units and at least 2 terms @ 2-units each)
- A single 4-unit PHYS 199H can be applied as a restricted elective for your physics major, as long as a PHYS 199 is not also applying.

How to Sign Up for a Special Studies Class in Physics

Click here and follow our step-by-step instructions to apply to be enrolled in a PHYS Special Studies course (you cannot sign up on WebReg). A single 4-unit PHYS 199 can be applied as a restricted elective for your physics major, as long as a PHYS 199H is not also applying.

For fall, winter, spring, the deadline to submit PHYS 99, 199, and 199H requests is Friday of week 1 (even during fall quarter, which starts with week 0). For each summer session, the deadline to submit PHYS 98, 99, 198, 199, and 199H requests is Friday the week *before* week 1.

We do not accept late requests. 3-5 different parties will need to take action on the request once you submit it. It can take about 5 business days for your request to be fully processed. The last person to take action on an approved PHYS 98, 99, 198, 199, or 199H request will be the Registrar's Office - they will enroll you (you cannot enroll yourself). **For ALL EASy/TEA requests:** If your request has not been fully processed within five business days, check EASy/TEA to see who currently has your request and then contact that particular office/party regarding your request (only contact the Physics Dept. about your request if EASy/TEA shows the request is still pending "Physics Department" review/approval).

Taking a Special Studies Class Outside of Physics

If you wish to work with a faculty member from another department, you must apply through that department, not the Physics Department. If the 4-unit 199 course is related to physics, you may petition to have it count as a PHYS UD RE your PHYS major.

Once you've enrolled in the *PHYS-related* 4-unit 199 course outside of the PHYS Department, you can click here to petition for an *Exception to the Major Requirements*, requesting the non-PHYS 4-unit 199 course count in place of the PHYS 199/199H we accept as a PHYS UD RE for our majors. Be sure to attach a copy of the "Student Input" page from your 199 EASy request, *along with a detailed project description*, for review by the Physics Department.

Approval of your petition is not guaranteed, so we recommend enrolling as soon as registration opens and submitting your petition immediately after. If your petition is approved, we will move the 199 into the restricted elective section of your major.

> Note for PY29 students: *If you are approved to use a 199 from outside of the Physics Department toward your restricted electives, you can still choose ANY focus area or no focus area (eg. if you get approved to use an ASTR 199 you are NOT required to use the "astrophysics" focus area).*

If your petition is not approved, you'll need to enroll in an eligible course to fulfill your major requirements, but you can continue with the Special Studies course for units toward graduation.

Note: If seeking credit for a paid internship, apply through AIP. You can petition to have a 4-unit AIP 197 course count in place of the 4-unit PHYS 199 we accept for your PHYS major if the AIP 197 was closely related to your PHYS major (and specialization, if you have one).

Publishing and Presenting Your Research, Attending Conferences

Looking to get published? Click here to see a list of undergraduate research journals.
Looking to present your research? Check out the following:

- UCSD Undergraduate Research Conference (URC)
- UCSD Summer Research Conference (SRC)
- The National Conferences on Undergraduate Research (NCUR)
- Acta Astronautica

Looking to attend a research conference and want to ask for travel funding? Check out the Student Financial Support webpage to learn about the Chair's Challenge.

Looking to get featured in relation to your research? Click here to submit a request to be featured in the Department newsletter.

For more opportunities to present and/or publish your research, check the Opportunities Spreadsheet.

Graduate Studies in Physics

Click here to listen instead of reading!

Disclaimer: *The status of graduate school opportunities is in flux at this time. It is imperative that you consult directly with graduate programs you're interested in for up-to-date information about options/limitations to apply to and attend their programs.*

Graduate studies in physics offer the opportunity to delve deeper into the fundamental principles of the universe, from quantum mechanics to cosmology, while developing advanced research and analytical skills. Those who should consider pursuing graduate school in physics are individuals with a strong passion for scientific inquiry, problem-solving, and a desire to contribute to cutting-edge research. It is especially suited for students who excel in mathematical reasoning, enjoy tackling complex challenges, and are interested in careers in academia, research labs, or industries like technology, engineering, and finance. Graduate school in physics is demanding and requires perseverance, but it offers rewarding intellectual growth and the chance to make meaningful contributions to our understanding of the natural world.

If you are uncertain if you want to go to graduate school, the Summer Training Academy for Research Success (STARS) might be a good way to explore this! As the program website indicates, "STARS offers student participants a rigorous research opportunity with esteemed UC San Diego faculty, informative transfer and graduate school preparation workshops, and educational, cultural, and social activities in sunny San Diego." The McNair Program is also something to consider. As the program website indicates, "The goal of the program is to encourage low-income and first-generation college students, and students from historically underrepresented ethnic groups to expand their educational opportunities by enrolling in a Ph.D. program and ultimately pursue an academic career."

Where have UCSD Physics Majors Gone?

The following is not an exhaustive list!

School/University	Program	Degree
Arizona State University	Physics	PhD
Brown University	Physics	MS
Caltech	Physics	PhD
Carnegie Mellon University	Physics	PhD
Columbia	MFE	PhD

Cornell University	Applied Physics	PhD
Duke	MSEC, Physics	PhD
EPFL	Physics	PhD
Georgia Institute of Technology	Physics	PhD
Harvard	CSE	Masters
Johns Hopkins University	Physics	PhD
JHU	MSFM	PhD
McGill University	Atmospheric Science	PhD
MIT	Physics	PhD
Northeastern	Physics	PhD
New York University	Physics	MS, PhD
Penn State	Physics	PhD
Purdue University	Physics	PhD
Scripps Research	Graduate Program	PhD
Stanford	Physics	PhD
Stony Brook	Physics	MS
University of California, Berkeley	Physics	PhD
University of California, Davis	Physics	PhD Program
University of California, Irvine	Physics	PhD
University of California, San Diego	Chemistry & Biochemistry	PhD
University of California, San Diego	ECE-Machine Learning and Data Science	PhD
University of California, San Diego	Physics	PhD
University of Colorado	Physics	PhD
University of Connecticut	Physics	PhD

University of Michigan	Physics	PhD
University of Oregon	Physics	MS
University of Pennsylvania	Materials Science & Engineering	MS
University of Rochester	Physics	PhD
University of Texas Health and Science Center - San Antonio	Physics	PhD
University of Illinois	Atmospheric Science	PhD
University of Illinois Urbana-Champaign	Physics	PhD
University of Washington	Physics	PhD
University of California, Los Angeles	MFE, Physics	PhD
University of Chicago	Physics	PhD
University of Southern California	ECE-Machine Learning and Data Science	PhD

Master's and PhD Programs in Physics outside of UCSD

Students must contact other schools, directly, for information about their programs. The Tips for Academic Planning at UCSD for Graduate School in Physics and Tips for Applying to Graduate School sections will provide helpful information, as well.

Master's and PhD Programs in Physics at UCSD

Click here to listen instead of reading!

The Physics Graduate Advising Team is the point of contact for questions/concerns about UCSD Physics graduate programs and general questions about applying to graduate schools, **but please read the following information before reaching out to them**. Click here to learn about the once per year application process to a UCSD Physics graduate program. Note that our PhD programs typically take 4-5-yrs to complete and allow for greater specialization and advanced career opportunities than 2-yr year Masters programs. Most schools offer a master's in Physics en route to the PhD as opposed to a standalone masters' programs. PhD programs allow students to conduct

advanced, multi-year research projects under the supervision of the PhD advisor, while also completing many advanced courses in core physics and advanced courses in particular areas of physics. Master's programs allow students to complete brief, less intensive/advanced, projects while continuing to be educated in core physics topics and some electives in particular areas of physics. PhDs also require a dissertation, while master's degrees typically can be awarded without a thesis. Undergraduates with stellar grades (3.5+) ***and*** strong letters of recommendation from faculty who supervise their research should plan to apply directly to Physics PhD programs. Students with less than stellar grades who are interested in a PhD may want to consider first applying to master's level programs in order to show growth and potential after the undergraduate years.

Here in Physics at UCSD we do not offer any stand-alone masters program that students can apply to. Instead, students apply to the PhD program in Physics and can earn a master's degree on route to the PhD (most other schools are similar).

For more information on UCSD Physics Graduate Programs, see:

- the UCSD catalog information about Graduate Studies in Physics at UCSD
- the Physics Graduate Application Details and where to send inquiries
- the UCSD Graduate Application

Post-Baccalaureate Programs for Physics

Click here to listen instead of reading!

Post-baccalaureate programs in Physics offer numerous benefits for individuals looking to enhance their knowledge and skills in the field after completing their undergraduate degree. These programs are particularly valuable for students who may want to switch career paths, deepen their understanding of specific Physics subfields, or prepare for graduate studies. Benefits include access to advanced coursework, research opportunities, and mentorship from experienced faculty. Additionally, post-baccalaureate programs often provide a supportive environment for individuals to strengthen their academic foundation before pursuing advanced degrees. Students interested in exploring post-baccalaureate programs and fellowships in Physics can refer to resources like the American Physical Society's website and the National Postdoctoral Association which offer comprehensive information on available programs, application processes, and potential funding opportunities.

Benefits of a Post-Baccalaureate Program in Physics:

- **Strengthen Fundamentals**: Reinforce key physics concepts.
- **Graduate School Preparation**: Gain rigorous coursework and research experience.
- **Research Opportunities**: Engage in hands-on projects to enhance your skills.
- **Networking**: Connect with faculty and peers for mentorship and career growth.

- **Career Transition**: Acquire credentials for new career paths in fields like engineering and data science.
- **Flexible Learning**: Enjoy part-time or evening course options to fit your schedule.

Bridge Programs for Physics

Physics bridge programs serve as pathways for students to transition smoothly from undergraduate studies to graduate-level physics programs. These programs are designed to fill any gaps in knowledge or skills that students may have before entering the rigor of graduate-level coursework. By offering specialized courses, mentorship opportunities, and research experiences, physics bridge programs help students build a solid foundation in physics and develop the necessary academic and research skills for success in graduate school. Additionally, these programs often provide valuable support networks and resources to help students navigate the challenges of graduate education, ultimately preparing them for careers in academia, industry, or research. See the search results on Pathways to Science for Physics Bridge Programs.

Tips for Academic Planning at UCSD for Graduate School in Physics

The requirements of bachelor of science degree in physics sufficiently prepares a student for graduate studies in physics within and outside of the United States. The faculty strongly recommend physics majors complete all courses in all core sequences (i.e. PHYS 100A-B-C, 105A-B, 110A-B, 120, 130A-B-C, and 140A-B) in preparation for physics graduate programs. Taking courses from particular research areas in the junior year, as well as conducting research, will also help when deciding which area of physics to pursue at the graduate level. Math 120A is strongly recommended for all physics majors pursuing graduate studies in physics; check with faculty in particular areas of physics to see what additional math courses might help you to prepare for the area of physics you'll pursue at the graduate level. Instead of chatting with Toni about additional classes to take to prepare for graduate school, you'll want to check with faculty doing research in the area of physics you're interested in.

Physics graduate programs typically assume prior completion of the B.S. Physics curriculum *or similar prior coursework*. For example:

- MATH 18 and 20ABCDE (Linear Algebra, Calc 1-3, Differential Equations, Vector Calc)
- PHYS 2ABCD (Mechanics, E&M, Waves, Thermo, Optics, and *some* Modern Physics)
- SE 101ABC (Mechanics)
- ECE 107 (E&M)
- ECE 35 + 45 + 65 (E&M Lab)
- MAE 105 + 107 (Mathematical & Computational Physics)
- CHEM 130 (QM)
- CHEM 131 + 132 (Staistical & Thermal Physics)
- ASTR 101-106 (Dynamics, Electrodynamics, Optics, Fluids, Thermo, etc.)

Note: Each department has sole authority over enrollment requirements, restrictions, and prerequisites for their courses.

Tips for Applying to Graduate School

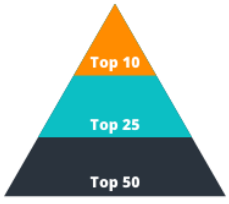
The information below relates to applying to graduate *physics* programs. *If you are interested in attending graduate school in a different field, you will need to consult with the undergrad and grad advising (and admissions) staff and faculty in the department(s) and programs owning your intended field to find out what, if any, supplemental coursework you should complete in physics and/or other departments to help prepare you to apply. You also need to consult with them (as opposed to Physics) to learn about the steps to apply.* You should also find out what knowledge, skills, and abilities (KSAs) they recommend in order for you to be a competitive applicant to their field at the graduate level. Keep in mind that each graduate program and school may have different admissions standards, so you should consult with all of the schools you are interested in to ensure you have a robust understanding of how to proceed with preparing to apply, academically and administratively. No matter the program, academics and research will be crucial to becoming a competitive applicant eligible for strong letters of recommendation (ref. the Research & Related Internships section asap if you have not started conducting research). **Apply broadly (i.e. apply to some top-tier, mid-level, and lower-level schools).**

Disclaimer: The information below includes opinions and advice from many parties and you should keep in mind that not all parties have the same opinion about a particular matter.

Usually, most physics majors pursue one of two paths: a career in academia or a career in industry. Going to graduate school is definitely necessary for pursuing academia and sometimes helpful for a career in industry. This page is dedicated to providing information to help you learn more about graduate school.

Finding a School

Google is probably the quickest and most easy way to find graduate programs in particular fields. For example, if you google “PhD Mathematical Physics” you’ll immediately get links for top grad programs such as Duke, Columbia, Princeton, etc. GradSchoolShopper is an amazing resource from the American Institute of Physics that helps you specifically select graduate programs in the physical sciences based on your preferences. Peterson's is also a good resource similar to GradSchoolShopper, however it is not specific to physics-related graduate programs. Ask professors and researchers, especially ones you have worked with, within your subfield where they think you should apply. These individuals will have an idea of which programs are stronger in your particular interest, as well as how difficult it is to be accepted at these various institutions. Apply to some top, mid-tier, and lower tier institutions. You can look up resources such as U.S. News, TopUniversities.com, etc. to see school rankings. When reviewing these types of sites, be sure to look into how each source comes up with their rankings.



Picking a PhD Advisor

An important aspect of your graduate education is your PhD advisor. This person could potentially serve as your mentor and connect you to the world of physics and a successful research career. However, he/she could also not be a good fit for you and have ideas about your research direction and career which are not what you had in mind. Thus, you should be mindful of choosing your advisor, since this person can make or break your graduate school experience.

In most physics PhD programs, you **do not** need to choose a PhD advisor before being admitted. Typically, you'll apply to the program and, if accepted, spend the first year or so exploring different research groups and areas of interest. During this time, you'll take courses and meet faculty members to determine which research group aligns with your interests and goals.

At many universities, students are assigned to different research labs during their first year (sometimes through rotations), allowing you to gain exposure to various research topics before deciding on an advisor. By the end of your first year or after a few rotations, you'll usually select a faculty member to become your PhD advisor.

However, some programs may ask you to list potential advisors or indicate research interests during the application process. In these cases, you're not technically committing to a specific advisor but rather helping the admissions committee gauge your fit with the department and its faculty.

When compiling your list of prospective schools, make sure to look at their websites and the research of the faculty whose work interests you (consider looking up faculty and researchers on Google Scholar). Usually, their websites will list current and former students. Look into their careers to see if this advisor has been successful at getting these people good postdoctoral positions or if these students have won any prestigious fellowship or prizes.

If possible, try to visit your prospective schools and meet with the professors on our list to see what they are like in person. Make sure to do background reading on their research prior to visit, as it shows that you are willing to learn and can think complexly about the topic. Ask them interesting questions (not something that can be answered by a simple Google search!).

Also, meeting with a potential advisor’s graduate students individually helps to get a better idea of what it is like to work with this advisor. Sometimes, if they are unhappy, they might not say it outright as it may get back to the advisor. Thus pay attention to their wording and "hidden" comments. Responses to look out for are:

- "He/she is okay most of the time, but prepared to work independently since he/she is not always around or too busy to answer e-mails..."

- "He/she can be a bit difficult to deal with at times..."
- "He/she loses interest if you are not doing exactly what his/her research direction is..."

Considering the School Itself

Look into some statistics and see how many students in the program go on to further their careers. If you can, visit your top choices. If the school is extremely interested, they will often fly you out or reimburse you for the travel funds. While looking at the school, pay attention to the community among the students and look into the offered classes. If you have the time, sit in on a lecture.

Questions to Ask While Visiting Graduate Schools

To the Department You are Visiting

What are the academic requirements to graduate?
What percentage of students pass qualifying exams the first time?
How many chances are there to pass qualifying exams?
What is the average time to obtain a PhD?
When and how do you choose your advisor?
Who selects the dissertation committee?
Is financial support offered through a teaching or research assistantship? How much is the stipend?
How many hours per week is expected for a TA or RA?
Is funding guaranteed?
Is there a teaching requirement? How are teaching assignments made (lottery or choice)?
What sort of computing facilities are available?
What are the provisions for housing, day care, health insurance, etc.?

To the Current Graduate Students

Do different research groups interact? Is there collaboration with the department or across departments?
What is the actual time commitment for a TA/RA?
What is the social atmosphere like?
Do grad students have access to university facilities?
Is there a strong graduate student organization?
Are the provisions for housing, health insurance, etc. adequate?
What are your likes and dislikes about this department/program?
Specifically, ask the female grad students: Do you feel this department/program is supportive of women?

Graduate Program Applications

Each graduate school program has a unique process of applying, be it paper or online, with different supplementary materials. It is a good idea to create a spreadsheet of application requirements for

each school, as well as their deadlines, allowing you to better prioritize time. It is helpful to get a professor/advisor to look over your application to see if there is anything you have missed.

The GRE (General and Subject)

For both the General and Physics GRE, scores are valid for five years. You must check with the graduate programs you are interested in prior to know whether they require or recommend the general and/or subject GRE (each individual program may have a unique status).

The GRE revised General Test is taken on a computer (unless you are outside the United States and Puerto Rico) and consists of three sections: Verbal, Quantitative, and Analytical Writing. You can score 130-170 points (in one-point increments) on the Verbal and Quantitative sections and 0-6 (in half-point increments) on the Analytical Writing section. The ETS GRE website has a bunch of information explaining the structure of the test, how scoring works, how to prepare for the test, and even a free practice exam. You can also register for the test, which is extremely flexible, as the general test is offered year-round, a couple times a week.

On the other hand, there is the Physics GRE, which is a 100-question, multiple choice exam, covering all topics from classical mechanics to specialized topics. You can score between 200-990 in ten-point increments The Physics 4 series content, as well as core UD PHYS content is included in the Physics Subject GRE, so strong mastery of the core LD and core PHYS content (PHYS 4A through PHYS 140A) will help you to prepare for the PHYS GRE.

The topic breakdown goes as follows (as taken from the ETS Physics GRE website):

Classical Mechanics (20%)
Electromagnetism (18%)
Optics and Wave Phenomena (9%)
Thermodynamics and Statistical Mechanics (10%)
Quantum Mechanics (12%)
Atomic Physics (10%)
Special Relativity (6%)
Laboratory Methods (6%)
Specialized Topics (9%)

Tips for Taking the GRE

General GRE

- Since the General Revised GRE Test is taken on a computer, it is best to familiarize yourself with the format of the test, as it is not your average paper test. The GRE website offers a free download of POWERPREP® II software, which allows you to take two practice tests in the computer format you will expect on the test day.

- Geisel has several GRE test prep books available for you to borrow! USE THIS RESOURCE! FREE PRACTICE TESTS!
- Magoosh has a very useful list of vocabulary words that frequently occur on the GRE. Practice using these words in contexts of sentences, instead of merely memorizing definitions.

Physics GRE

- Be on the lookout for the annual event hosted by the Faculty Advising Committee on Physics GRE Prep!
- Start studying in the summer before the Physics GRE!
- Talk with PHYS majors who have already taken the Physics GRE to find out which core LD and core UD PHYS topics are heavily covered on the exam.
- The raw score is based on how many questions you've answered correctly minus one-fourth of the number you answer incorrectly. Thus, while the Physics GRE does not penalize you for not answering a question, it does penalize you for guessing. Statistically, if you can eliminate a few choices and guess, you may do better than not answering it at all.
- Since this test is 100 questions, and you have 170 minutes to finish, you get 1.7 minutes per question. This means it is essential that you get through these questions as quickly as possible without compromising your accuracy. The tips below are specifically for this.
    - As with all tests, if you do not know the answer to a question within a reasonable amount of time, skip it and come back to it in the next round.
    - A lot of the questions can be solved by looking at the units, order of magnitude calculations, or just checking the boundaries of the problem.
    - If you find yourself doing heavy calculations or extensively deriving an equation to solve a problem, there is probably an easier way to do the problem. If you cannot think of the easier way, skip that problem and save the heavy calculation for last. It's better to get more questions correct than get hung up over getting one correct.
- As much as you are taught not to memorize formulas, you will want to have concepts, formulas, and solutions to typical problems memorized, since you want to move through the problems quicker.
- Make sure to target studying classical mechanics, electromagnetism, and quantum mechanics (which comes along with atomic physics). These are the largest portions of the exam, and thus require the most amount of your knowledge.
- While we were always encouraged to derive our own equations to avoid memorizing them, it might be best in this case to actually memorize equations, since you need to recall them quickly for use in the exam. Do not waste time deriving equations.
- Help Links
    - PhysicsGRE.com is a great independent site with lots of tips and advice on how to prepare for the exam.
    - The Ohio State University has a great physics GRE study site. Their site has all of the released tests.
    - GREPhysics.net has detailed solutions to all of the physics GRE questions.
    - Kaplan and Magoosh and Varsity Tutors offer GRE preparation services that you may want to look into.

- This link includes helpful info. about preparing for the Physics GRE.

The Curriculum Vitae (CV)

The CV is a succinct summary of your academic background and accomplishments. The purpose of the CV in this case is to get the reader interested and invite you to interview for their graduate program. The difference between a CV and a resume is that the CV is to specifically showcase all your academic accomplishments as opposed to tailoring a one-page document of general job experience for a specific job. Keep your CV updated with your academic interests, education, research experience, etc. The Career Services Center provides consultations to help you look over and edit your CV prior to turning it in.

The Statement of Purpose

A statement of purpose should convince the reader (specifically, the faculty on the selection committee) that your achievements show promise for your success as a graduate student. Each school will have a different prompt, however, essentially, these prompts are asking for the same four pieces of information:

What do you want to study at graduate school?
Why do you want to study it?
What is your experience in your field? (Discuss the relevance of your activities if you don't have experience explicitly relating to your field)
What do you plan to do with your degree once you earn it?
Make sure to do background research on the program you are applying for, as well as relevant research currently being done at that university. Keep in mind the instructions regarding length and deadlines for each graduate program. Make sure to tailor a unique statement of purpose regarding each program you are applying for. It is beneficial to reflect on your academic, social, and personal journey in this statement.

Letters of Recommendation

Usually, physics graduate programs require three letters of recommendation as a part of the application process. Ask professors who know you well or you have done research for. A good piece of advice is to ask the professor whether or not they can write a ***strong*** letter of recommendation for you, since it's always possible for professors to write a mediocre letter. You should compile a portfolio of information about yourself and about your request that the professor can refer to when drafting your letter. The portfolio should include a document with important information about yourself, a copy of your CV, your statement of purpose, the list of graduate programs you are applying for, and instructions for submitting the letter of recommendation to the school(s) you're applying to. **You must**

also provide to each recommender a signed Letter of Recommendation Release form so that gives them your consent to release information about you. Use the Physics faculty directory to obtain contact info. for physics professors you want to approach. Email each faculty member individually and ask if they can meet with you for 10-15 minutes to discuss your graduate school plans and the potential for obtaining a letter of recommendation. Once at the meeting, you can discuss with the faculty member the possibility of obtaining a strong letter and, if they agree to provide one, you can provide them with your portfolio (you can give them a cursory introduction to what's included, but won't need to go through every document in the portfolio in great detail during the meeting). *Note: This info. Is applicable for both grad programs and for internships.*

Document with Information about Yourself should include:
The classes you have taken with this professor and the grades you've received
The research you've done with the professor
Your ethnic/cultural history
Any extracurricular activities throughout your college experience
Why you are interested in the program that you are pursuing
Your cumulative and major GPAs
Any challenges that you've faced during your college experience

The Graduate School List should include the following about each school you are applying to (if you don't know where you're applying, tell the faculty you'll provide this info. Once you know it):
Name of the school
Person/program to contact
School address
Deadline for submission of the recommendation
Relevant website(s)
A brief statement about why you're interested in the school and who you hope to work with at the school

Instructions for Submission should include:
Whether the recommender will receive an email from the institution with submission instructions? If so, when should the recommender expect to receive the email?
To whom should the letter be addressed?
What specific questions need to be addressed in the letter?
Does the recommender need to fill something out in addition to writing your letter?
When is the deadline for submission of these recommendations?
How should the letter be submitted? (If by mail, include a pre-stamped and addressed envelope for submission)

Make sure to formally thank the professor for writing and sending your letter of recommendation.

Graduate School Fellowships

UCSDs Graduate Education Postdoctoral Affairs Office (GEPA) manages external fellowships for graduate school, so please click here to see what they post/provide. For each school you are applying to, check their website and contact the program to ask about fellowships they own and operate. Also look for external fellowships. For example:

NSF fellowships
NASA fellowships
Department of Energy
Grants.gov
GRAPES
AAUW (for women)
Amelia Earhart Fellowship (for space sciences)
Ford Foundation
Hertz Foundation
Jane Street Graduate Research Fellowship
Two Sigma fellowships
IIE and Fulbright Programs
IEFA Scholarship Database
ProFellow

Company Sponsored Funding for Graduate School

Pursuing graduate school in physics through a company sponsorship can be a great way to advance your education without the financial burden. Companies, particularly in industries like tech, aerospace, energy, and finance, may offer sponsorships that cover tuition costs in exchange for a commitment to work for the company after graduation. This arrangement allows you to gain hands-on experience while studying, apply your research directly to real-world projects, and benefit from professional mentorship. However, it often comes with the expectation that you'll remain with the company for a set period post-graduation. It's a win-win for both your academic growth and career development.

To explore company-sponsored graduate school in physics:

1. **Identify Potential Employers**: Research companies in fields like tech, aerospace, energy, and finance that value advanced physics skills.

2. **Check Company Programs**: Visit their career or graduate recruitment pages to see if they offer tuition reimbursement or sponsorship programs.

3. **Reach Out**: Contact HR or recruitment to inquire about available graduate school sponsorships and their application processes.

4. **Align Your Interests**: Tailor your application to show how your graduate studies will benefit both your career and the company's goals.

5. **Explore Internships**: Consider internships or co-op programs, as they can lead to sponsorship opportunities.

Careers for Physics Majors

Physics prepares students for a wide variety of future options - see What Can I do with This Major?

Physics majors are expected to use the Triton Career Guide and work with a Career Center coach on career planning, *including* students seeking to first go to graduate school. The Physics Advising team may request to see a copy of your guide during advising sessions to see where you are in the planning process, so please have and keep this document up-to-date and available for viewing in electronic format!

Our graduates are successful in many career paths, from entering business and industry following the bachelor's degree to those completing graduate studies, to then go into business, industry, government research laboratories, or academe. The UCSD Physics undergraduate program makes you a great problem solver and critical thinker, which is an asset to *any* company. To see how far reaching a physics major can take you, we recommend you google "careers for physics majors" and be sure to check out the career info. At the APS site (and for jobs at national labs and research facilities in CA, look at this particular page of the APS website). It is important to keep in mind that career options **will not** be unique based on specialization *within* the BS. However, career options are highly likely to be unique based on a BS vs a BA, and between the BA w/out the Specialization in Secondary Education (the latter being designed for a student seeking a teaching credential).

For career planning, start with the resources below. If you find a few careers of particular interest, reach out to 5-10 companies that employ in those areas and inquire about the qualifications required for the job and what makes a competitive applicant. Knowing this information is absolutely crucial, as you'll want to tailor your undergraduate education around the courses that would provide the knowledge, skills, and abilities (KSAs) to prepare you accordingly. This is also the best way you decide whether it might be beneficial to double major and/or pursue a minor. **International Students** at the *undergraduate* level, please also click here to see opportunities to work in the US after graduation.

Career Exploration

Here are some resources for career exploration:

What Can I do with This Major?
Use this tool to get an overview of what you can do with a PHYS major and can allow you to further explore particular areas of the field. See common career pathways, a sample of employers, strategies, and tips on how you can advance. The site also shows some professional associations, and places to seek employment opportunities.

Check out the UC-Wide Career Pathways data to build confidence that your degree is worth it!

LinkedIn
LinkedIn can help you to see where our past grads have ended up and you can begin networking with them and seeking career advice. Learning from alumni about their pathway through and beyond the undergraduate physics program can provide you with invaluable insight on steps to take to ensure a smooth transition into industry after graduation. Be sure to connect with the UCSD Physics Department LinkedIn so that you can have access to alumni in PHYS!!

UCSD Career Center
The Career Center does the lionshare of work to help UCSD students do the non-academic (and non-research related) preparation for entering the workforce (e.g. determining what careers are available based on your passion (from there you can figure out if you're in the appropriate major to prepare for it), learning how to interview, draft a resume, search for jobs, etc.) and so it is imperative that you visit the Career Center often, regularly attend events hosted by the Career Center, and stay on top of checking the Career Center website for helpful information and opportunities.

One of the best ways to know if you're in the appropriate major to be a competitive applicant for a particular job/career is to find out what degree(s) those currently in the career/job obtained. The Career Center will be able to help you identify careers and then you can use resources like Tritons Connect and LinkedIn to connect with professionals in those careers to learn more about the degree(s) they obtained. Keep in mind that an undergraduate physics degree equips students with a deep understanding of the physical world, excellent analytical and problem-solving skills, and the potential for meaningful contributions to science and technology. It offers a solid foundation for diverse career paths and provides an exciting journey into the mysteries of the universe.

Remember, Physics majors are expected to use the Triton Career Guide and work with a Career Center coach on career planning, including students seeking to go to graduate school. *The Physics Advising team may request to see a copy of your guide during advising sessions to see where you are in the planning process, so please have and keep this document up-to-date and available for viewing in electronic format!*

International Union of Pure and Applied Physics—Corporate Associate Members
This is a resource that may be particularly helpful for international students.

The Basement
Google Physics Job Search

- You can even search for jobs by specialization by googling “Jobs for biophysicists”!

Glass Door - Jobs in Physics
The American Institute of Physics (AIP)

- Be sure to check out the Who’s Hiring Physics Bachelors? webpage!
- Be sure to check out the Career Options poster!

Indeed
LinkedIn
Handshake

Tips for Writing an Effective Resume

Check out this article from the American Physical Society (APS) on how to draft an effective resume. *The American Physical Society is a nonprofit membership organization working to advance physics by fostering a vibrant, inclusive, and global community dedicated to science and society. APS represents more than 50,000 members, including physicists in academia, national laboratories, and industry in the United States and around the world*.

Student Clubs

Society of Physics Students (SPS)

The purpose of this organization shall be the advancement and diffusion of knowledge of physics, the encouragement of interest in physics throughout the academic and local communities, and the introduction of students to the professional community. We are devoted to fostering a welcoming social and academic community for all UCSD undergraduates interested in physics. Our events include research presentations, socials, lab tours, the physics graduation ceremony, and more!

- Click here to see the SPS website!
- Click here to sign up for the SPS club!

Young Physicists Program (YPP)

The UCSD Young Physicists Program brings middle and high school students from across the San Diego region together with physics graduate students and professors from UCSD on Saturday mornings each month to learn about fundamental topics in the quantifiable world via simplified college-level laboratories and interactive demos.

- Click here to see the YPP website!

Finding / Starting a Student Organization

Click here to see all of the student orgs you may be able to get involved with.
Click here to learn the process to start a student organization. Please be sure to use the point of contact info. at the link for any questions/concerns (the Physics Dept. is not in charge of the process to establish a student organization). Student orgs that are requesting financial support from the Physics Department must be formally registered UCSD student orgs. Chatting with the Physics Advisor and existing club board members are also great ways to learn more about how to effectively run your new club!

Administrative Info. for Student Organizations

- Student Organization Mail, Offices and Websites
- Financial Processes for Student Organizations
- Request a department space for your event. Send requests 2-3 weeks in advance, be sure to include your proposed date(s), start and end times (include setup and cleanup time), and seating capacity. As soon as you have secured your dept. space, it is your responsibility to work directly with SPS-Facilities to setup room access for your reserved day(s) and time(s).
- Request to use the Student Success Center (SSC) (please note this is **NOT** department space).
- Budget Requests - consult your group's departmental point of contact for financial matters.

Tools for Physics Majors & Those Taking Physics

Physics majors are encouraged to bookmark the Tools for Physics Majors Google Drive Folder, which contains information students usually ask the advisor about. The Drive includes the following folders:

- Advising & Schedule Planning Material
- Blank Forms & Templates
- Dept. Handbook (This folder simply includes the document you're reading right now :))
- Enrollment Policies and Protocols
- Important Emails
- Major Checklists aka Major Requirements
- Course Syllabi
- Opportunities
- Physics Tutor Lists
- Post Grad Planning
- Student Clubs
- 2021-22 Event Material
- 2020-21 Event Material

The Degree Audit

The degree audit is a tool that can help you see your progress in degree requirements, but is not the authority on degree requirements (the UCSD catalog is the authority on this). The degree audit is programmed and managed by a central office on campus and it is pretty common to find errors in the coding in the degree audit. Make sure to regularly check your degree audit and compare it to the UCSD General Catalog you are under (in most cases, it's the one from the academic year in which you started UCSD) and your Academic History Report (AHR) to ensure that the degree audit is accurately reflecting your degree requirements and progress. It is your responsibility to regularly monitor your degree audit and report to your college/dept any errors you find. Errors on degree audit do not qualify students for exceptions to degree requirements, so it's very important to know your degree requirements and progress and make sure your audit is properly showing this information.

How to Get in Touch with Physics Faculty

Please click here to see the Physics Faculty directory. Currently, email is the primary way to get in touch with a physics faculty member. If you do not receive a reply within 3-5 business days, it's best to send a follow-up message, as your initial message may have accidentally been missed in the faculty member's email inbox. If you still do not receive a reply after sending a follow-up message, please alert the Physics Department through the Virtual Advising Center (VAC) so that we can try to help you get connected. Please Note: For course-related matters, some instructors may require you to reach out through Canvas, Piazza, etc. You must use the method of contact your instructors direct students to use and to allow the amount of time they indicate they need in order to receive a reply.

Strategies for Success in Physics

The Tips for Academic Success provides guidance that is useful for all UCSD classes. Also consider the info. below and in the section titled How to Improve Academically.

To achieve success in physics, students should adopt several effective strategies. First, it is essential to establish a strong foundation in mathematics, as the PHYS major requires the integration of mathematical concepts with physical principles. Engaging in a community of learners is also beneficial; forming study groups and discussing physics with peers can enhance understanding and retention. Additionally, seeking guidance from faculty and teaching assistants during office hours and by asking questions in class can provide valuable insights and clarification. Preparation for lectures is crucial; students should complete required readings in advance and consider utilizing supplementary resources, such as YouTube videos, for additional content exposure. It's important to master a concept before moving on while also embracing the idea of successive growth—recognizing that the more you practice, the better you will become. Instead of focusing solely on assigned homework problems, students should strive to work through all available problems to deepen their

understanding. Finally, participating in "Problem Solving Sessions" will not only reinforce learning but also provide opportunities to seek help with challenging problems. By employing these strategies, students can navigate the complexities of physics more effectively.

Making Sure Your Courseload is Manageable

Time management is key to success. You may want to do it all, but your available time ultimately determines your ability to succeed. This quick process can help you assess whether your course load is realistic:

1. **Get Your Syllabi (Day 1)**
   Collect syllabi for all courses.

2. **Map Your Term (Week 1)**
   On a calendar, mark all quiz, exam, and assignment dates. Block out class times, study time, homework time, work hours, and other commitments, *including* eating, sleeping, exercising, ***and*** recreation.

3. **Schedule Study & Work Blocks**
   Assign study times for each quiz/exam and blocks for assignments.

4. **Spot Potential Overload**
   Review your calendar week by week. If your study time is clearly insufficient, contact your major department and college immediately to discuss adjustments. If unsure, continue to Step 4.

5. **Track Your Experience**
   Keep a daily log of:

   - Grades on quizzes/exams/assignments
   - Study time and methods
   - Sleep patterns and energy levels
   - Any signs of burnout and causes

6. **Review Weekly & Act Early**
   Look for patterns linking your grades, study habits, and well-being. If, **before Friday week 4***, you see you cannot improve within your available time, take action in WebReg before the drop deadline. If time isn't the issue but you're still struggling, immediately seek help from instructor and TAs, your department, and/or your college. **WARNING:* The last day to drop a course without a "W" is **Friday of week 4**. Some labs must be dropped earlier, after the second scheduled meeting, a "W" is issued. Physics **does not** have an early lab drop deadline.

Forming Study Groups

As a physics major, forming a study group can be incredibly beneficial. Physics can be challenging, and working with peers allows you to share diverse perspectives on problem-solving and understanding complex concepts. Collaborating in a group helps reinforce your knowledge, provides motivation, and often leads to a deeper understanding of the material. Plus, study groups can improve your communication skills, which are valuable for both academic and future professional settings.

How to Form a Study Group at UC San Diego:

1. **Find Classmates:**
   Ask peers in class or post a message on TritonLink/Canvas inviting others to join.

2. **Set Goals:**
   Define your group's purpose (e.g., exam prep, problem sets) and schedule meetings (weekly, 1-2 hours).

3. **Pick a Location:**
   Reserve study rooms in Geisel Library (our SPS Club can also reserve dept. and/or Student Success Center space).

4. **Organize Meetings:**
   Share materials ahead of time (notes, practice problems) and set specific meeting agendas.

5. **Collaborate & Be Inclusive:**
6. Encourage open discussion, help each other with difficult topics, and ensure everyone contributes.

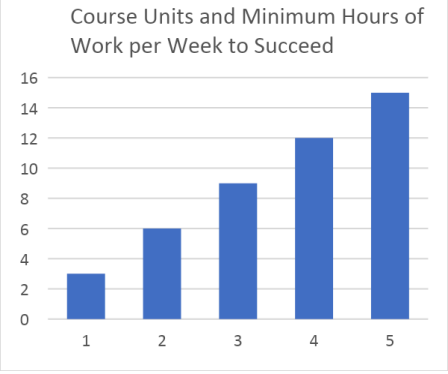
7. **Stay Focused:**
   Stick to the meeting goals and respect everyone's time.

8. **Keep It Engaging:**
   Incorporate interactive activities like quizzes and friendly competitions, and take short, energizing breaks to maintain a positive, motivating atmosphere.

How to Improve Academically

“What can I do to improve my performance in my courses?”

- Try to identify why you are struggling
- Reconsider your study methods and study times (study when help is available)
- Seek resources



Is there anything your instructor/TA can do differently to help? Is it a lack of preparation in specific area, such as algebra, geometry, vectors etc.? Or conceptual type of problems/questions? Is it the model-building part? Do you have a set schedule for studying on a daily basis?

How much time do you spend on these courses?

Could you spend more time? Could you use some help finding more effective study strategies?

Sometimes it is easy to think you are the only one struggling and not notice that others are having difficulties. This can lead one to believe in a “fixed mindset” or the belief that it is not possible for you to learn and do better in the future. Speak with others to determine just where you stand.

Physics is about concepts and practice. Learn some concepts and then work problems to practice what you learn; work through problems all the way, even through all the algebra. Do all the homework, and if necessary, put all your notes away and do it again from scratch. Same with exams: take them again, even after you’ve already seen the solutions. Regularly experience the feel of working through an entire problem, even
if it’s not entirely original to you.

Seek out help on the homework – go to office hours with an attempted solution (the TA or professor can then point you in the right direction and/or tell you what went wrong). If you simply go in and say, “I can’t do problem #4,” an instructor is not always willing/able to give you helpful, targeted advice. Instead, go in ready to discuss ways you tried to approach the problem. In addition, do as many problems as you can until they are easy for you to do. If, every time you see a problem you don’t know how to do it, why would the exam go any differently? Practice thinking through examples/problems you’ve already done successfully and work with others to go through a problem without jumping ahead to see the solution.

On Improving from One Exam to the Next

When you have taken an exam and did not earn partial or full credit for a particular question, it is important to review the exam with your professor or teaching assistant. Students are encouraged to bring their exam to office hours or a scheduled meeting and work through the question with instructional staff to identify the underlying issue.

During this review, consider the following questions. Did you understand what the question was asking? Did you begin solving the problem correctly? Did you appropriately work through the problem to arrive at a solution? Did you effectively show your work?

Especially in upper division courses, earning full credit typically requires more than arriving at the correct final answer. Students are expected to demonstrate how they arrived at that answer. Thinking like a physicist is essential. Physicists break complex problems down into components and build solutions step by step. This process provides evidence of conceptual understanding and mastery.

If your final answer was incorrect, work with your professor or teaching assistant to determine where your reasoning or process broke down. Identify the point at which an error occurred and discuss strategies for avoiding similar mistakes in the future. Determine which key concepts require further review and what specific skills or problem types you should practice to improve future performance.

Reflect on the essential takeaways from the assessment and identify what you need to better master before the next exam.

On Effort and Time…
Students often cite non-academic factors when reflecting on a course and a grade they believe they deserved. Attending class, going to office hours, and spending significant time studying can and often do support student success. However, citing these factors may suggest an expectation that non-academic criteria should directly contribute to a course grade.

While some instructors may award points for attendance or participation in class-related activities, the majority of a course grade is typically based on formal assessments (for example, quizzes, exams, and projects). To affect a course grade, mastery of course content must be clearly and effectively demonstrated on those assessments.

It is important to recognize that more time spent does not necessarily result in more correct answers, and greater effort alone does not guarantee greater success. Similar to a recipe, achieving the desired outcome requires the right ingredients in appropriate proportions and combined in the correct way.

Students are encouraged to partner with their instructors and teaching assistants to (1) clearly understand expectations, (2) develop the appropriate knowledge, skills, and abilities, and (3) demonstrate mastery of items (1) and (2) on course assessments.

Additional Resources to Improve Academically

How to see if you have a manageable course load for the term
Content Tutoring
Hiring a Private Tutor
OASIS
Piazza Forums
Podcasts
SI Tutoring
Tutoring Resources by Department

Exam Preparation

For each formula on the formula sheet, do 3 things: (1) draw a diagram illustrating the formula in action; (2) for each symbol in the formula, say out loud what it means in words (engages important cognitive functions), and (3) say out loud what units it's measured in. Rework homework problems until you can do these 3 things for the entire formula sheet.

Try to prepare for lectures to get more out of them. No matter how "good" / "bad" you think the lecturer is, you can adjust the way you approach the course to get more out of the lectures. For example, if you're in a class where the lecturer is simply repeating the material from the book line-by-line, you should make an attempt to read the relevant material ahead of time. Even if you don't understand everything, try to get the main point of what is being discussed. Create 2-3 questions that you walk into lecture with that you can ask about (if they aren't directly addressed in the lecture).

Most physicists would agree that going to lecture is not enough — you have to practice the material yourself, make mistakes, and think through problems to refine your understanding of the material.

Physics Calendar of Events & Opportunities

Check out the Physics Undergraduate Events and Opportunities Calendar every day to see events you can attend and opportunities you can pursue.

Student Jobs

On occasion, academic departments and other academic-related units on campus hire undergraduates for academic and non-academic purposes. Please click here regularly to see which academic departments are hiring undergraduates for academic related jobs (i.e. Instructional Assistant (IA) positions such as TA, Grader, Proctor, Tutor, etc.) and apply for any/all positions you are interested in. If interested in a Physics position, you must follow additional steps found here (as per this link, Dawn Love will be the point of contact for questions about (IA positions in Physics). For all other jobs, you will need to regularly check The Commons and the Student Jobs Resources to see what positions are available. **International Students** at the *undergraduate* level: please click here to see opportunities for Curricular Practical Training (CPT) while enrolled at UCSD and click here to see opportunities to work in the US after graduation.

Policies

Academic Integrity

Click here to see campus policies on academic integrity. Keep in mind that employees of the University are expected to report any/all potential violations.

Enrollment

Please see the following section(s) of the *Physics Enrollment Policies* webpage for the relevant policies and procedures:

- What are prereqs?
- When do prereqs need to be completed, and what grades are accepted?
- Where can I see the prereqs for a physics course I'm interested in?
- Prereqs that are missing (eg. not taken, F grade, NP grade, Incomplete "I" grade)
- Prereqs that are planned or waitlisted
- Courses restricted to physics majors
- Undergraduates seeking to enroll in graduate-level courses. Also note the following about the diagnostic:
  - I
- Prereqs taken outside of UCSD
- Clearance to Enroll
- Unit Limit Exceptions
- Course Conflicts
- Late Adds
- Concurrent Enrollment
- Requesting an incomplete grade
- Auditing
- Course Fees
- Special Policies during the Pandemic

Student Conduct

Click here to see campus policies on student conduct. Keep in mind that employees of the University are expected to report any/all potential violations.

Relationships Between Undergraduates and UCSD Employees

Click here to see campus policies on relationships between undergraduates and UCSD employees. The Office for the Prevention of Harassment and Discrimination (OPHD) is responsible for receiving complaints and investigating suspected violations of this policy and for providing appropriate training to the campus community. Academic Personnel Services (APS) is responsible for ensuring that the

disciplinary process for violations of this policy is handled in accordance with the Academic Personnel Manual and campus delegations of authority.

Course Equivalency

Some physics courses have pre-approved equivalencies with UCSD and do not need to be petitioned. Please check the sources below before petitioning for a physics course equivalency.

Lower Division Physics Courses from Other UCs and California Community Colleges

See the TRANSFER section of the Physics 1 & 2 Series FAQs for equivalency info. For transfer physics courses from other UCs and from California Community Colleges.

A-Level Course Exemptions

Please click here to learn about course exemptions available based on A-Level Physics and how to get exemptions posted to your UCSD record.

Equivalency by Petition

If your course or exam does NOT already have an approved equivalency, please note each department may have a unique procedure to have coursework reviewed. Use the appropriate link below and note departments cannot guess the likelihood of approval of any request:

MATH Course or Exam

- 🔹 Submit a Math Transfer Equivalency Petition.

PHYSICS Course or Exam

- 🔹 Submit a Physics Course Equivalency Request.

  Note: If you took a combo of courses from schools with different names, you must petition, even if the schools are in some way affiliated.

CSE Course or Exam

- 🔹 Submit a CSE Course Equivalency Request.

CHEMISTRY Course or Exam

- 🔹 Submit a Chemistry Course Substitution Request.

- 🔹 Submit a Biology Course Equivalency Request.

Exceptions to University Policy

Most commonly applies to:

- Requests for retroactive add/withdrawal from a physics course
- Requests to repeat a physics course for the third time
- Requests for extension to an Incomplete Grade

All petitions/forms needing the review and/or signature of a Physics instructor and/or the Physics Department Chair and/or the Physics Undergraduate Advisor MUST be converted into a single PDF packet submitted via our online document submission portal.

Do not submit petitions/forms directly to physics faculty members or to dept. staff via email; do not submit any documents in-person.

These requests require you to download, complete, and submit an Undergraduate Student Petition along with particular supplementary materials based on the nature of the request. Contact us through VAC before you draft and submit your petition, as there are specific departmental protocols that we need to discuss with you.

Quarter Limit Policy

UCSDs quarter limit policy prevents enrollment beyond normative time (12 terms for freshman, 6 terms for transfers). The colleges manage the quarter limit policy and alert students through VAC if they are nearing the limit. The colleges provide the link to the Completion Plan that must be completed if requesting permission to enroll beyond the quarter limit. Direct questions about the quarter limit to your college through VAC.

Unit Limits & Exceptions

Each unit at UCSD consists of a minimum of 3 hours of work per week, including lectures, discussions, homework, reading, etc. So:

- 12 units is equivalent to a minimum of 36 hours of work per week;
- 16 units is equivalent to a minimum of 48 hours of work per week;
- 20 units is equivalent to a minimum of 60 hours of work per week, and so on.

Click here and read step #4 to learn about the limit on the number of units you can take per term and for the campus procedure for requesting exceptions. Please also note the following important information:

IMPORTANT NOTE: In most cases, EASy requests cannot be used to exceed the unit limit for a PHYS course. Unit Limit Exception requests can take at least 5 business days to be fully processed by all required reviewers.

Only the Registrar's Office has the authority to add a student to a course that would put (or keep) them above 22 units. As a result, they are the final reviewer of Unit Limit Exception requests.

The Registrar's Office has indicated that they cannot add students to course waitlists. Therefore, **we will not approve a Unit Limit Exception request under the following circumstances:**

- The course is full at the time we review the request.
- The course has seats available but has an unprocessed waitlist.
- The course has 5 or fewer available seats (since it could become full before the request is fully reviewed).

If a physics course you want to take is full or has 5 or fewer available seats, **do not submit an EASy request for a Unit Limit Exception**—it will not be approved. Instead, follow these steps:

1. Go to WebReg and drop one of your enrolled courses that still has many seats available.
2. Add or waitlist the physics course that is full or has 5 or fewer available seats.
3. Submit a Unit Limit Exception request for the course you dropped.

Resources (Campuswide)

UC San Diego offers a variety of resources to support you both personally and professionally. Whether you need assistance with physical, mental, or emotional well-being, or guidance in your academic or career path, there are numerous services available to help you succeed. Be sure to explore the campus support networks to access the tools and guidance you need to thrive during your time here.

Basic Needs

The Basic Needs Assistance Form: A form to request support for students facing food insecurity, housing instability, or other basic needs challenges, helping them access available resources.

Urgent Assistance

Triton Core: A platform for students to access emergency financial assistance, basic needs resources, and other forms of urgent support during times of need.
Triton Concern Line: Call (858) 246-1111

Campus & Department Safety

Get educated and request services that will help you get safely from point A to point B.

See the Department's Safety Information

See the campus' safety information

Academic Advising

The Virtual Advising Center (VAC): An online platform that provides students with access to academic advising, resources, and support to help them navigate their educational journey.

Educational Resources

Office for Students with Disabilities (even temporary ones): Provides academic accommodations and support services for students with disabilities, including temporary conditions, to ensure equitable access to education.

UCSD Extended Studies: Offers non-degree courses, professional development, and certificates to help students and community members continue learning beyond traditional academic programs.

Teaching & Learning Commons: A hub for academic support, offering resources like tutoring, workshops, and peer mentoring to enhance student learning.

Geisel Library: The university's main library, providing resources, research assistance, study spaces, and access to academic materials and collections.

OASIS: The Office of Academic Support & Instructional Services, offering tutoring, academic counseling, and workshops to help students excel academically.

IDEA Learning Center: Engineering Learning Communities (ELCs) are formal study groups for the Math 20, Chemistry 6, and Physics 2 series.

Summer Session: Provides opportunities for students to take additional courses during the summer, accelerating their degree progress or exploring new areas of study.

Student Services Resources

Career Services Center: Offers career counseling, job search resources, internship opportunities, and resume-building workshops to help students prepare for their professional future.

Center for Student Involvement: A resource for getting involved in student organizations, leadership opportunities, and campus events to foster community engagement and personal growth.

GSDI: Supports international students, students of diverse backgrounds, and those seeking to explore global learning opportunities and diversity-related programs.

LATINX: Provides resources, support, and community for Latinx students at UCSD, including cultural programs, mentoring, and leadership development.

Lived Name: A service allowing students to use their lived name (rather than their legal name) on various university records and systems, supporting gender identity and cultural expression.

Price Center: A student hub that offers dining options, lounges, meeting spaces, and other resources to support student life and community.

Student Services Center: A one-stop location for academic advising, student records, and other essential services to support student success and well-being.

Tritonlink Tools: Online tools and resources for UCSD students, offering access to personal academic information, campus news, and other student services.

Undocumented Student Services: offers support, legal resources, and programs to help undocumented students navigate academic, financial, and immigration challenges

International Resources

International Center: Provides services, counseling, and support for international students, including visa services, orientation programs, and cultural exchange opportunities.

Programs Abroad Office (PAO): Supports students seeking to study abroad, providing guidance on programs, applications, and scholarships for global academic experiences.

Health and Wellness Resources

Counseling & Psychological Services (CAPS): Provides mental health support through counseling, therapy, and crisis services to help students manage personal and academic challenges.

> *Physics Majors, please remember that **you are not alone**!! UC San Diego's mental-health network is designed to be accessible, confidential, and responsive to the pressures of academic setbacks. Taking the first step to connect with CAPS or Triton CORE can provide both immediate relief and longer-term strategies for getting and staying on track toward graduation*.

TogetherAll: An online peer support platform that connects students with a community to share experiences, express emotions, and receive guidance in a safe, anonymous environment.

Support Groups: Offers various group therapy sessions for students dealing with specific challenges or mental health concerns, fostering a supportive peer environment.

The Zone: A wellness and recreation space where students can engage in physical and mental health activities, focusing on relaxation and stress reduction.

Student Health Services: Provides medical care, preventative health services, and wellness education to help students maintain physical health while navigating college life.

CARE: Center for Advocacy, Resources, and Education (Formerly SARC): Offers confidential support, advocacy, and resources for students impacted by sexual violence, relationship violence, or stalking.

Student Health and Wellbeing: Focuses on overall student health, offering resources and services related to physical, mental, and emotional wellbeing to promote a balanced college experience.

RIMAC: The Recreation, Intramural, and Athletic Complex offers students access to fitness facilities, intramural sports, and recreational activities to support physical health.

Campus Security: Provides safety services across campus, including emergency response, patrols, and crime prevention resources to ensure student and community security.

Triton Food Pantry: Offers free food and basic necessities to students in need, promoting food security and reducing barriers to academic success.

Housing-Related Resources: Provides support for students with housing needs, including finding on- and off-campus housing, dealing with housing insecurity, and connecting students to local resources.

Click here to see list of additional resources.

Online Self-Care Support and Resources for Students

Willo
Willo is an all-in-one self-care app that helps students **navigate UC San Diego's health and well-being resources** and recommends services based on interests and needs.

Headspace
Headspace is a mindfulness app that **teaches you how to meditate in everyday life**. Free for registered UC San Diego students and up to 5 invited loved ones.

iRelax
iRelax is a **curated list of audio relaxation recordings** by Counseling and Psychological Services. Audio recordings are available in a variety of languages.

Behavioral Health Screenings
Behavioral Health Screenings is a free, anonymous tool to help you determine if your recent thoughts or behaviors may be associated with a common, treatable mental health issue.

Well-Being and Mental Health Guides and Handouts
Explore the CAPS website for a wide range of mental health and well-being resources. These handouts offer **valuable strategies for managing anxiety and stress, regulating mood, and enhancing focus and attention.** You'll also find helpful information on self-care, sleep hygiene, and building healthy relationships.

Student Affairs Resources

For contact info. for college advisors, deans, etc.

Revelle College
John Muir College

Thurgood Marshall College
Earl Warren College
Eleanor Roosevelt College (ERC)
Sixth College
Seventh College
Eighth College